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Devoted to the Interests of the Profession.

EDITED BY

JAMES W. WHITE, M.D., D.D.S.

Observe, Compare, Reflect, Record.

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THE

DENTAL COSMOS.

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ORIGINAL COMMUNICATIONS.

THE DECIDUOUS TEETH: THEIR ERUPTION AND REMOVAL.

BY C. N. PEIRCE, D.D.S.,

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(Read before the American Dental Association at Niagara Falls, August 4, 1887.)

THAT the evolution of human dentition has, in common with the dentition of other mammals, been from a simple and homogeneous type to a more complex and heterogeneous one, both as regards structure and form, is established beyond a doubt; and in this modification of tissue from the simple to the complex, and its arrangement, nutrition and the *dietetic* habits have been accepted as important factors.

In considering intelligently the origin and peculiarities of mammalian teeth, and what might constitute a primitive mammalian dentition, it would seem quite necessary to have some definite knowledge of the teeth of the mammalian ancestry, and from these note the gradual change.

If, as has been suggested, we are limited in our choice to the Batrachia and Reptilia as mammalian progenitors, then to these animals must we look for our most primitive tooth-forms. These we find consisting of cone-shaped anchylosed crowns, the number large, uncertain, and frequent, and the succession almost endless.

Accepting the "placoid scale" or the "dermal denticle" as the structure from which all teeth were primarily derived, we have these teeth of the Batrachia and Reptilia as a step in advance, while in certain of the Reptilia a still further progress is made in the implantation of the teeth in distinct sockets, with the addition of a cingulum or an abortive cusp on the crown, and a tendency to bifurcation of the roots by flattening and longitudinal grooving.

From these primitive forms, with numbers and durability so varying, there is much room for modification before we reach the scalpriform incisors of the Rodentia, the trenchant sectorial tooth of the Carnivora, and the broad grinding molars of the Herbivora, or the

less specialized and comparatively fixed in form and number teeth of man. The uncertainty in the number and in the succession of the teeth of the Reptilia as compared with the two sets and definite numbers of the higher mammals has led to much conjecture regarding the origin of this definiteness, and to an effort to determine whether the deciduous or the permanent set is entitled to the credit of priority in its evolution; or, in those mammals which have but one set, whether it is the permanent or deciduous which has been lost.

Prof. Owen, in his effort to express concisely the conditions of replacement, made use of the terms "diphyodont" and "monophyodont," and applied them as relative and interchangeable terms with "heterodont" and "homodont," believing that animals having two sets of teeth (diphyodont) had teeth differing in form and complexity in the several localities in the mouth (heterodont), while those having but one set (monophyodont) had teeth of similar form occupying the inferior and superior maxillæ (homodont); but to this rule many exceptions have been found.

Dr. Wortman, in speaking of the relationship of the deciduous to the permanent set, asks: "Are they, the deciduous teeth, superadded embryonic structures similar to the amnion and allantois, which subserve a temporary purpose and disappear with approaching maturity, or are they to be homologized with the first set of teeth of the lower vertebrates?"

The very rudimentary condition of the milk or deciduous teeth in some mammals is evidence of their transitional character; and if it is true that tissues most recently developed are frequently the first to be atrophied, it would seem that these were superadded structures. On the other hand, we must recognize the fact that the enamel-organs of these deciduous teeth arise *de novo* from certain portions of the lining membrane of the oral cavity, and that at a period in their progressive stage of development, by a process of budding, the enamel-organs of their permanent successors arise from the necks of the enamel-organs of the deciduous teeth, just as those of the temporary set do from the epithelial layer of the mouth. Another fact in this connection must also be noted, viz., that the germs of the first permanent molars by their *de novo* origin stand physiologically in the same position as the more anterior deciduous teeth, and that the germs of the second permanent molars arise from those of the first, and the third from the second, just as do the germs of the permanent anterior teeth from the enamel-organs of their predecessors.

In noting the origin of the first permanent molar, Dr. Wortman says: "There is one thing upon which I would strongly insist, and

that is, that the first true molar in the human dentition is a persistent milk molar."

In following the development of the deciduous teeth from the appearance of the epithelial eminence, the epithelial inflection, and the epithelial bands or enamel-organs, we recognize various progressive changes in the germinal tissues between the seventh and the seventeenth week. Modifications are taking place during this period in the embryonic structures for the development of the twenty temporary teeth, and, commencing about the fifteenth week, for the development of what is recognized as the first permanent molar. From the seventeenth week these rudimentary structures for the temporary teeth begin to assume on their prospective coronal extremities the shapes of the future crowns; and as the process is completed by the development of ameloblasts for the enamel and osteoblasts or dentinoblasts for the dentine, the solidifying process commences by the deposition of the salts of lime in these previously prepared tissues. This process goes on, probably not without temporary interruption, until the crowns are completed, the incisors at about the fortieth week of fœtal life, or at birth, the molars and cuspids when the infant is not more than six months of age.

At this time the crowns are advancing toward the mucous surface, facilitated by a threefold action, viz., the elongation of the dental pulp, the calcification of its surface to form the dentine of the root, and the adhesion of the dental sac or follicle to its solidified periphery. This last process places the cemental germ or matrix in position and stimulates it into functional activity, for until this period we have only had preparation for the development of two of the hard dental tissues (enamel and dentine); but with the cement matrix in position germinal development is completed, and growth henceforward progresses, modified only by accident or systemic and nutritional conditions.

This gives us, at about the twentieth week of intra-uterine life, the deciduous tooth-germs with their partially-calcified tissues incased in bony crypts, which have been calcifying in the form of septa between the developing germs.

Inclosed first in a sac, the outer layer of which becomes ossified, the calcified tooth-crown, with its primitive structures and elongating root, is completely surrounded by a bony structure, each tooth in its own individual apartment, and occupying it so fully that room for growth can only be secured by the absorption of the superimposed tissue.

The inferior mandible shows an irregularly calcified groove, ossification of the septa being at this period of embryonic life in a delicate and imperfect condition. The superior jaw has a similar

appearance, with septa more decided, though the structure is not so readily displayed. The teeth, removed from their incasements, represent the exact extent of calcification; the incisor crowns having attained about two-thirds of their normal length, while the cuspids and molars have little more than formed their cusps.

The superior centrals, both above and below, have the process absorbed from their labial surfaces, while the palatal and lingual surfaces are still covered by a border of the alveolar process kept prominent by the crypts which contain the germs and partially calcified crowns of the permanent successors.

The absorption of the superimposed tissue from the advancing crown, and the elongation or growth of the root by an increase in the pulpy mass or formative tissue, and its calcification, are the progressive developmental processes which we term "eruption of the teeth." While we shall not now discuss the propriety of the term used to express this physiological action, it is a pertinent inquiry whether "eruption" is an appropriate name for the process under consideration.

The force by which the teeth are propelled toward and through the mucous surface into position is thought by many to be something in addition to that indicated above as the result of normal growth. However this may be, there are occasional aberrant or abnormal results which this theory will not explain, viz., teeth erupted at birth or a few weeks after, which teeth are not further developed than normal, yet the crowns are exposed as fully as if calcification were complete, such teeth being without further attachment with the subjacent tissue than the adaptation of the gum to their necks, while the uncalcified pulp is in juxtaposition with the base of the crown or of the abortive root, as the latter may have been more or less developed.

Such premature eruptions are usually found in children suffering from improper nutrition or other abnormal systemic conditions, and are independent of the force resulting from normal growth. The question at once arises, whether such premature presentation of the tooth-crown is not wholly due to an absorption or wasting of the superimposed tissue, rather than to the elevation of the crown, which could not well take place without growth of the root, unless it were from the contraction or an expulsive effort of the tooth-follicle.

Charles S. Tomes, in his "Dental Anatomy," p. 191, in speaking of this elevation of the tooth-crown, says: "Very strong objections have been brought forward, clearly proving that this cause (elongation of the root) is quite inadequate to explain all that may be observed. In the first place, teeth with very stunted roots, which may be practically said to have no roots, are often erupted. Again,

a tooth may have the whole length of its roots completed, and yet remain buried in the jaw through half of a person's life, and then late in life be erupted. Moreover, when a healthy normal tooth is being erupted, the distance traveled by its crown materially exceeds the amount of addition to the length of its roots which has gone on during the same time."

A further illustration from the same author is given from "Comparative Anatomy:" "The tooth of a crocodile moves upward, tooth-pulp and all, obviously impelled by something different from mere elongation; and my own researches upon the development and succession of reptilian teeth clearly show that a force quite independent of increase in their length shifts the position of and erupts successive teeth. But what the exact nature of the impulse may be is an unsolved riddle, the explanations which I have read being, to my mind, less satisfying than the admission that we do not know."

In reference to impacted teeth, *i. e.*, teeth whose elevating or eruptive tendencies have been restricted or entirely obstructed from any cause, whether it be unabsorbed bone or indurated gum-tissue: when the root completes its development under such unfavorable conditions, it is usually stunted, or curved (more frequently the latter) in the direction where the surrounding tissue yields most readily. Hence the curvature of the roots is invariably posteriorly, or toward the tuberosity or the ramus, as the tooth may be located in the superior or inferior maxilla.

Teeth in a horizontal position, or inverted, as sometimes occurs, are subject to the same law of progress or projection, that is, in the line of the least resistance. All such teeth, when once fully formed without being erupted, make very slow progress toward the mucous surface, except when adjacent or overlying teeth are extracted; then the necessary absorption of their alveoli exposes to view the previously imbedded teeth. There is a mechanical force, however, acting on all such teeth, tending to bring them to the surface, the same as that which induces the elongation or protrusion from the socket of an unantagonized tooth. The repeated closing of the jaws must exert, to a large extent, this mechanical force, just as the bung in a barrel is elevated by a blow being struck upon the stave on either side of it.

With normally erupted teeth, from six to eight months after birth, the bony crypts, which have scarcely completed the protective cell for the partially calcified tooth-germs and follicle, begin to be absorbed. This process goes on with considerable activity until the labial or outer wall of the alveoli is removed, which takes place in advance of the portion covering the cutting edges. The temporary

teeth are not all in the same progressive stage of development; hence we find that while some of the anterior teeth are being freed from their bony incasement the posterior ones are still retained within their crypts, or it may be that some of them are but perfecting their inclosures.

The absorption of the process from the incisor crowns takes place in the average child at seven months of age. The labial surfaces and cutting-edges are free from the bony covering, while the lingual and palatal surfaces are yet protected by the spongy bone which forms part of the crypt of the permanent successor. As soon as these crowns have freed themselves from their bony surroundings and have perforated the superimposed gum, the alveolus rapidly develops around the necks of the teeth and the elongated roots, the depth of the anterior part of the jaw increasing rapidly by this process; and as the molars are erupted, a similar condition in the posterior part of the jaw is concomitant with the elongation and elevation of the rami. Charles S. Tomes says (p. 192, "Dental Anatomy"): "The front teeth are erupted first, and the jaw deepens first in front; later on, the back teeth come up and the jaw is deepened posteriorly; meanwhile, the elongation of the rami has been going on slowly, but without interruption. Thus is brought about a condition of parts allowing of the whole series of teeth coming into their proper mutual antagonism."

It is very evident that the eruption of the teeth is not a continuous process, but that they have periods of growth and of rest, not only of the individual teeth, but of the teeth as a whole, as they are developed in groups or pairs, these periods of rest and growth being modified or intensified by the conditions controlling the function of nutrition.

While, as a rule, the inferior centrals are erupted first, there are so many cases where the superiors make their prior appearance that the exception must be noted. In the following text and table let it be understood that it is only intended to represent the periods of eruption of the deciduous teeth of the average child, giving a range of two or three months for the several groups or pairs, the writer believing that this will cover the large majority of cases.

The deviations from this "time," as just stated, may be earlier by three or four months, or later by the same period. So constantly is premature development associated with abnormal systemic conditions, that it may be stated, with little danger of contradiction, that where the teeth are in process of eruption from the first to the fourth month the infant is suffering from either deficiency in quantity of blood or deficiency in some important constituents of the blood (anemia). On the other hand, a delay in the eruption from

the tenth to the thirteenth month as frequently finds the subject vigorous in body, with the nutritional condition representing all that this implies. The lateral incisors are usually from one to two months later than the centrals, and, reversing the order of the centrals, the superior laterals invariably precede the inferior. The first molars next in order have their cusps uncovered by the absorption of the gum from four to six months subsequent to the appearance of the laterals, there being no regularity in the priority of their eruption in one jaw over the other.

The cuspids, following with about the same intermission, make their appearance between the lateral incisors and first molars; their progress is remarkably slow, and sometimes their eruption is delayed until after the appearance of the second molars. Various reasons have been ascribed for this delay. Trousseau thinks it is due to the greater length of their roots, but the probability is that, coming between teeth already in place, they have a denser and thicker tissue to penetrate. A longer time is required for the removal of this tissue and for the completion of the root, which latter process must be reckoned as one of the factors in bringing the crown into place. The experience of the writer has been that the eruption of these cuspids, when occurring during the months of July, August, and September, invariably induces greater systemic disturbance than any of the other groups would under similar circumstances.

The eruption of the second molars usually follows close upon that of the cuspids, probably not more than one or two months intervening. With these the deciduous or temporary dentition is completed, usually during the first two years of life, and sometimes this age is not reached by two months. A delay in the beginning of the eruptive process is not necessarily followed by a corresponding delay in its completion. The writer has been acquainted with three families where no teeth were erupted before the eleventh or twelfth month, and yet the process was completed by the twentieth month and without unusual systemic disturbances.

At the sixteenth week of fœtal life the follicle which incloses within its folds the enamel and dentine organs or germs of the future tooth is closed, and the epithelial band, which has thus far served to hold these germs in connection with the epithelium of the surface, is broken, and the prospective tooth-germs are in what may be called the second stage, or saccular condition. Quickly following this, lime-salts are deposited upon the surfaces of these two organs, and a cap of dentine and a layer of solidified enamel-cells represent the shape and density of these two dental tissues. From the first appearance of these layers of solidified structures a pro-

cess has begun which, when carried to its normal completion, must result in a dental armature completely occupying the alveolar ridges of a two-year-old child; and from the beginning of this process we shall, for convenience, date the growth of the hard dental tissues, following them in the subjoined table from the commencement of calcification to their completion and arrangement in the dental arches, as follows:

17th week of embryonic life, enamel and dentine of central and lateral incisors begin calcification.

18th week of embryonic life, enamel and dentine of molars and cuspids begin calcification.

20th week, calcification of crypts which incase enamel and dentine germs begins.

40th week, or at birth, calcification of incisor crowns quite complete and roots begin to calcify.

3 months after birth, cuspid and molar crowns complete and roots begin to calcify.

6 to 8 months, central incisors erupted.

7 to 9 months, lateral incisors erupted.

14 to 16 months, first molars erupted.

17 to 18 months, cuspids erupted.

18 to 24 months, second molars erupted. Temporary dentition complete.

While the above table represents the average eruption of the deciduous teeth, there are many exceptions, representing tooth-eruption at earlier and later dates. As above stated, the earlier are usually in infants less vigorous in constitution than normal, waste exceeding supply, while the later periods are most frequently confined to those of good recuperative power and other favorable systemic conditions.

At the time of the eruption of the deciduous or temporary teeth the apical end of the root or roots is not necessarily completed in its calcification, and oftentimes some months elapse after the tooth has taken its place in the arch before the foramen in the end of the root is reduced to its normal size.

The arrangement of the teeth in two parabolic curves, the superior describing a larger segment than the inferior, with the external cusps of the molars and the cutting edges of the superior anterior teeth closing a little external to the inferior, is a normal position seldom deviated from in the deciduous or temporary set. The teeth when first perfected are also equal in height, so that, resting the antagonizing surfaces upon a plane, all would bear equally upon it; they also stand side by side in close juxtaposition, without diastema or spaces between them.

This last is a peculiarity of temporary duration, however, and is not usually observable after the fourth or fifth year. The crypts

containing the partially-developed permanent teeth which are to succeed the deciduous ones, behind or posterior to which they lie, are gradually pushing forward and occupying a more anterior position; and in this developing process the temporary teeth may be observed to be slightly separated. They are also, from the same cause, elevated from that uniform height which marks the early normal development.

The roots, which we have seen become perfected and present cone-shaped apical ends with minimum-sized foramina, are of short duration, for scarcely more than a year elapses after their completion before preparation is made for a retrograde metamorphosis, which results in the gradual dissolution of the lime-salts and a return of the organic elements in the root to their embryonal condition.

In the effort to tabulate this interesting and obscure physiological process,—the decalcification or absorption of the roots of the deciduous teeth,—it is difficult to do more than approximate the time at which it takes place. The period at which it begins, as well as the several progressive points indicated by the figures expressing years of age, though probably not accurate to the month, are yet sufficiently correct to warn the dentist of the need of great care in the application of arsenic for the devitalization of the pulp and in the subsequent treatment of the pulp-chamber and root-canal. This process, beginning first in the roots of the incisors, progresses gradually, when it is to be completely and normally accomplished, from near or at the apical end of the root toward the crown, occupying about three years in dissolution; and usually releases the crown of the deciduous incisor between the seventh and eighth years, the absorption of the centrals' roots ordinarily preceding those of the laterals by some months. The absorption of the roots of the first deciduous molars may be placed a year later than those of the lateral incisors, beginning about the middle or close of the sixth year, and terminating with the removal of the first deciduous molars, about the tenth year, the second molars following usually some months or a year later. The cuspids, not infrequently the last of the deciduous teeth to be shed, have their period of absorption extending from the eighth to the twelfth year. While these periods mark the absorption and removal of the teeth in the average mouth, so variable are they in different families that many wide differentiations may be found.

Charles S. Tomes,* in speaking of root-absorption, says: "It was a matter first accurately investigated by my father. The root, at or near to its end, becomes excavated by shallow, cup-shaped depressions; these deepen, coalesce, and thus gradually the whole is

* Dental Anatomy, p. 195.

eaten away. Although absorption usually commences on that side of the root which is nearest to the successional tooth, it by no means invariably does so; it may be, and often is, attacked on the opposite side, and in many places at once.

"The cementum is usually attacked first, but eventually dentine, and even enamel, comes to be scooped out and removed by an extension of the process. That part of the dentine, however, which immediately surrounds the pulp appears to have more power of resistance than any other part of the tooth, and thus often persists for a time as a sort of hollow column."

That the absorption of the temporary teeth is absolutely independent of pressure is evidently the conviction of Mr. C. S. Tomes; in which the writer fully concurs, though he would take issue with the statement that a successful absorption may begin on other localities than the apical end of the root, and go on to completion.

The absorptive process, though a physiological one, is certainly somewhat obscure, and in contradistinction to the evolution of the tooth may be termed its dissolution.

The evidence of its being the result of a physiological action is in the fact that it matters not from how many centers it has commenced, it must, to be successful, involve in its early stages the root-canal and pulp therein, the latter maintaining vitality until the completion of the process, as the very moment vitality of the pulp ceases, that instant this retrograde metamorphosis designated "physiological absorption" terminates.

What induces this molecular dissolution it is difficult to state, though the several conditions which are always present and essential are readily recognized, but the part each plays is not easily ascertained. The place of its commencement, at the end of the root, the retention of pulp-vitality, and the presence of a vascular papilla in close proximity to the absorbing surface, with the fact that the surface of this papilla is rich in giant-cells, termed "osteoclasts," are evidently essential accompaniments, and the absence of any one of them would certainly militate against the completion of the process.

The statement that the presence and pressure of the permanent tooth are essential cannot be sustained, as frequently the decalcification of the deciduous tooth is successfully accomplished in the absence of its successor. Again, we often find the permanent tooth impacted against or within the bifurcated roots of the deciduous molar, or pressing down by the side of its single-rooted predecessor, both being more or less displaced by the persistence of the unabsorbed deciduous roots. That the organ has served its purpose, and the nourishment which had previously been appropriated by it is

diverted or relegated to its successor, are probably important factors contributing to the success of this interesting physiological process.

This demonstration of dissolution is not alone confined to the roots of the teeth. The rami of the inferior maxillary give evidence of a similar phenomenon by absorption from their anterior borders, with corresponding growth of the interstitial tissue, giving development and prominence to their posterior lines.

There are also bone-cased cavities and canals, increasing in diameter and capacity by absorption from within and addition to the surrounding walls. These, we conclude, are the results of similar physiological efforts.

In considering the absorption of the roots of deciduous teeth, we must not overlook the difference between what has just been designated a physiological process, dependent upon the vitality of the absorbing structures and its contiguous tissues, and the pathological one, which is the result of a suppurative process following the devitalization of some of the same structures. In the former case, as above stated, when successful, the absorption begins at the apical end of the root, and removes the tissue by a gradual encroachment toward the crown, the interior of the root yielding to the solvent most readily, so that there is constantly maintained an inverted cup-shaped cavity into which protrudes the above-described vascular papilla, the active organ in this retrograde metamorphosis. On the other hand, when the pulp is devitalized and an alveolar abscess is established at the apex of the root, a very different condition is presented. Through the influence of the pus in which the root is constantly bathed it presents a peculiar worm-eaten appearance, the shallow grooves oftentimes encircling the root, and presenting several more or less broken, ring-like excavations, varying in depth and wholly unlike in progress and completeness of result that which we have described as being physiological and occurring in the vital root, the devitalized root never in the writer's experience being wholly removed by the pathological process.

We have thus described the influence of what we have been pleased to designate normal and abnormal or physiological and pathological absorption upon the roots of the deciduous teeth.

These same absorptive processes have not been without their influence upon the permanent teeth; but when acting upon these structures much more frequently do they assume an abnormal type. In the large majority of cases disease has been the exciting cause; hence root-disintegration of the permanent tooth would in such cases be pathological. So dissimilar are the two processes, both as regards the progress and the appearance they present, that one would

hardly hesitate for a moment in designating that process affecting the devitalized permanent teeth as pathological, in contradistinction to the one removing the deciduous teeth, which we have styled physiological.

The exciting causes which stimulate in the vital permanent teeth the abnormality under consideration may be classed as largely mechanical,—*i. e.*, injuries, such as partial dislodgment and replacement, malposition of the affected or the adjoining tooth, and a crowded condition of the arch.

It is rarely—indeed, it might be safe to say it is never—possible for a tooth to be dislodged from its socket and replaced, or another tooth inserted in its stead, without there being a persistent effort to reduce to its embryonal condition the bordering-line of one or both tissues which have been disturbed. If this effort is properly sustained by systemic nutritional wealth, the harmonious readjustment of the tissues to each other does not result in much sacrifice of structure; but with feeble recuperative power, deficiency in quality and quantity of pabulum appropriated, and hence in quality and quantity of blood, permanent deficiency of tissue must result. Of all the teeth inserted or reinserted with which the writer has been familiar, a final loss of the tooth by root-absorption could be traced to systemic peculiarities and defective manipulation as important factors inducing the result. That the most exqusite technical skill cannot insure success without regard to temperamental and nutritional qualities, goes without saying.

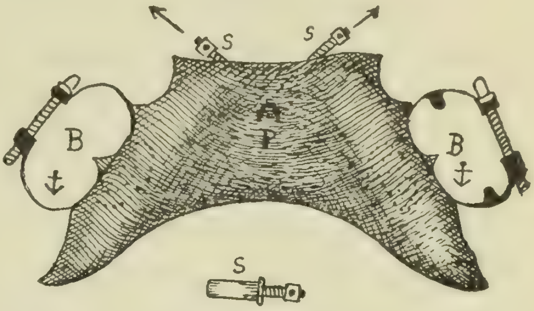
ANCHORAGE OF REGULATING PLATES CONSTRUCTED UPON THE PRINCIPLE OF POSITIVE MECHANICS.

BY J. N. FARRAR, M.D., D.D.S., NEW YORK CITY.

The question, "What is considered the best way to anchor a regulating plate?" is so often asked of me through the mails, that I have thought it may be of sufficient interest to others of my professional friends to make a reply through the Dental Cosmos. As I have in press a work on regulating, in which several modifications are fully shown, I shall only attempt now to give the principle, by explaining one modification, but with sufficient clearness to enable any dentist to make others. Whether the plate be whole or skeleton, I fix it in the mouth by binding it to the side teeth by means of a clamp-band, vulcanized into the edge of the plate. This plan is especially valuable in cases where considerable strain or draught is to be made upon it. Fig. 1 illustrates a device constructed upon this plan for moving two instanding upper laterals.

In detail this fixture is made as follows: Two gold or platinum clamp-bands are made of ribbon, rolled from 18-carat wire; afterwards cut to a suitable length to extend around one or more of the side teeth, usually the bicuspids. To each end of these ribbons is soldered a nut, one smooth-bored, the other threaded, which are connected by a gold screw for the purpose of tightening the band when in use. On the side of the band opposite to the screw is soldered an ear-piece of thin plate gold, about one-eighth or one-fourth of an inch in width, to extend into the edge of the rubber plate. These anchor-bands are then fitted on the cast, and the plate vulcanized to them by the usual process of making plates for artificial dentures. We have here the principles of an anchorage that will withstand any draught or force necessary to move any tooth in any direction.

FIG. 1.



PROCEEDINGS OF DENTAL SOCIETIES.

NINTH INTERNATIONAL MEDICAL CONGRESS.—SECTION XVIII. DENTAL AND ORAL SURGERY.

FIFTH DAY—*Morning Session.*

(Continued from page 763, Vol. xxix.)

THE Section met at 11.15 A. M., President Taft in the chair.

Prof. J. Busch, Director of the Dental Institute of the Royal University of Berlin, Germany, was to have read a paper on "The Comparative Pathology of the Teeth, with Special Reference to the Tusk of the Elephant," but instead made a brief address, describing the specimens which he had brought with him. He spoke in German, his remarks being translated by Dr. F. H. Rehwinkel, one of the secretaries of the Section.

Prof. Busch said that, although the specimens that he would show were not human teeth, many diseases of the dental organs were so similar in them to the lesions of the human teeth that a close relation could be traced between them. The first specimen was a tooth of one of the smaller species of whales, in which the pulp-chamber was invaded by a disease which resembled caries, though he would not say that it was caries. There was a slight possibility that the cavity had been commenced by some boring animal. Though caries, as far as he had observed, seldom occurred in

the larger animals, alveolar abscess was of frequent occurrence among them. The next specimen which he would present showed the effects of alveolar abscess in the partial destruction of the root of a tooth of the elephant. The next showed a pus-cavity in the outside of the tusk, extending very near to the pulp-chamber. Another specimen showed a "needle" formation of the dentine, caused by abscess and the effort of nature to repair the loss sustained. The next specimens showed the same effect; in one the cavity was formed in the dentine close to the pulp, but with sufficient dentine intervening for its protection. In another the abscess originated in the pulp-chamber, extending outward, and a protecting wall was thrown up by the pulp, as seen in the new formation of bone. The next specimen was a remarkable production of secondary dentine from an abscess within the substance of the pulp. It very nearly filled the chamber at this point, so that while the pulp was not entirely obliterated it was very much compressed, and eventually died. The next specimen showed no apparent cause from the outside of the tusk why there should be such a cavity on the inside, and he was of the opinion that it must have originated from the pulp-chamber, and bulging out, by slow disintegration of the dentine before it, forced its way to the place where found. In this connection he would call attention to the fact that the growth of the elephant's tusks never ceased during the life of the animal. In the next two specimens it would be found that the deposition of lime-salts had, from some cause, taken place irregularly, there being an evident tendency to deposit in spots, which became enlarged and assumed the shape of bullets. The separation of these formations from the regular dentine could be plainly seen. A study of one of these settled the question beyond a doubt as to how the separation occurred, showing the result of that particular abnormal deposit. When the formation had progressed to a certain stage, there came a process of desiccation or drying, and then was the time when the separation or seams occurred which were perceptible in the specimens. The next specimens showed the process of the formation of dental nodules in the soft pulp of the tusk. These usually proceeded from the walls of the pulp-chamber, with which they were connected. After a time this connection was severed, and the nodules were then found separate in the soft part of the pulp. One of the specimens showed the nodule still attached to the wall, the other separated. He thought it was safe to assume that such nodules always had their origin at the side of the chamber, and it was only after their separation had been effected that they were found independent in the tissue of the pulp itself. The next specimen showed the process of union of fracture in the root,

with a large callus. All dentists knew that even in human teeth fractured roots would once in a while be reunited by callus, though it was of rare occurrence. It was more frequent, he apprehended, in animals. The process was similar to the union of fractured bone. The next specimen showed the effects of traumatic injuries upon the dentine. In this case an iron bullet pierced the dentine, passed through the pulp, and was imbedded in the dentine of the opposite side of the tusk. The cavity appeared entirely closed, the depression being formed behind the bullet by the deposition of secondary dentine opposite the side shivered. The next and last specimen he presented because the leaden bullet which it carried was not imbedded deep enough to interfere with the pulp. The point of interest was that there was a new deposit of dentine at the place of entrance, which must have been produced by the alveolar investment of the tusk or by the pulp. As the pulp was not touched, the source of the deposit seemed to be a question not easily answered.

Prof. Busch then begged indulgence for the presentation of an appliance which he had found very useful in the removal of warts and moles, and which he called a cutting cylinder. [The appliance was similar to Dr. Rollins's circular engine-knives.] The method of using was to measure the size of the growth to be removed, taking a cylinder of the proper size,—it should not be too large nor too small, but just large enough to encircle the growth without touching it,—and with a quick rotation by the engine cut it, and lift it out, detaching it with the knife or scissors; stop the hemorrhage, and dress with a wad of cotton for eight or ten days, when nothing would remain but a small cicatrix. Sutures should not be used, but the wound should be allowed to heal itself. The operation had its limits, and was not advisable if the wart or mole was very large. The largest instrument he used was one and one-half centimeters in diameter.

Dr. W. H. Atkinson, New York, desired to return his thanks to Prof. Busch for the opportunity of examining the magnificent collection of specimens of pathological ivory which he had shown. He recalled the time when in the shops where the elephants' tusks were cut they used to discard these specimens now beginning to be so useful to us. It was difficult to criticise such a presentation in the legitimate way of criticism, and what he would say would not be in the manner of fault-finding, but rather in the spirit of inquiry. If there had been less assumption of knowledge of cause he would have been better satisfied. When the building power was diminished these globular spaces were formed. The specimen in which the denticles were seen showed that the calcoglobulin was in such a condition (semi-fluid) that the consolidation of the lime-

salts was confined to the denticles. He knew the why of nothing; he only knew the how, and that so little that he was almost ashamed to stand before his auditors and attempt to show it to them. He thought Prof. Busch failed to show that the nodules came from the periphery of the pulp. When there was enough lime-salts to completely consolidate them, it would be found that the formation began at the center and proceeded outward in concentric rings, which militated against the orgin which had been ascribed. Prof. Busch suggested, if he did not say it, that in the African elephant there was at the first formation of the tusks an enamel-tip, which was afterward worn off. Many eels had a tip of enamel on their teeth; in fact, the speaker knew of no teeth in which there was not an enamel builder as a fore-step to the dentine-former. Indifferent corpuscles were transformed into bone, muscle, or nerve-tissue, and in the earlier stages it was difficult to distinguish dentine from enamel. In some of these specimens, which had been pointed out as examples of secondary dentine, he could not see a bit of dentine that was a secondary formation. They had not been melted down and recalcified. It was assumed that in cases of advancing caries the lime-salts were melted out, but that had not been demonstrated. The lime-salts were there; they were simply melted down, reduced to a soft mass, but they were not taken away. Every case which had been called abscess in the demonstration was an assumption. Every cavity with a smooth surface arose from pulp-tissue.

Dr. Geo. J. Friedrichs, New Orleans, could not comprehend that the spaces seen in the specimens were produced by abscess. In one of the specimens at least the cavity was entirely closed. In human teeth it sometimes occurred that a portion of the pulp was cut off entirely from the main body, and thus a space was produced in the tooth. Sometimes a horn of the pulp was found high up in the crown, and we came across it unexpectedly in excavating. He had always associated pus with abscess, and if these cavities contained pus it would seem to have been encysted. He would like Prof. Busch to explain what he actually meant by the term abscess as used in connection with these specimens.

Prof. Busch could not account for all the phenomena observed. In the first place there was an injury to the growing tusk, which was followed by inflammation and pus, and then the secondary dentine was deposited. He was led to believe that the cavities which he had ascribed to abscess had been at some time filled with pus, because always on opening into them a penetrating odor was observed only found in putrid matter. He could not account for the origin of the injuries in all cases, but the cavities must have been formed by pus. It was entirely too imaginary to suppose that there were two pulp-cavities in the tusks.

Dr. Friedrichs thought that the function of the pulp in the elephant's tusk must be different from that of the human tooth if these cavities occurred as explained by Prof. Busch. All dentists cognized the fact, that if pus formed in the pulp-chamber of the human pulp, that pulp was destroyed. At least, that was the speaker's experience, and he could not realize how pus could be formed from the pulp and then be encysted without injuring the pulp.

Dr. W. C. Barrett, Buffalo. The tusk of the elephant arose from a persistent pulp, and the course of its growth was elongation and prolongation. There could be no pus without infection; there must have been a place where the microbes obtained access. When the tusk was in its early stage it had only a cap of dentine, and if a wound were made near the base of the pulp at this time it might be infected with the germs of pus. Thus, a bullet might enter the base of the tusk where there was only a thin layer of dentine, and the wound be afterwards closed by coalescence; the point of infection at the base might be carried outward by the progression of the tusk until it was found in the solid portion thereof. But that suggestion did not give an explanation of the presence of pus or the formation of a cavity in the dentine absolutely. New dentine-forming cells might be produced, and he could thus conceive of new dentine being formed over a cavity originating as suggested. It did not seem reasonable that a pus-cavity could arise in the body of the formed dentine, where there was no longer a pouring-out of the indifferent corpuscles; but it did seem quite possible to comprehend the occurrence in the manner suggested of a cavity in the body of the dentine which might contain the débris of the pus which was originally in it.

Dr. A. E. Baldwin, Chicago, wished to protest against the doctrine that microbes must be present to produce pus. In one sense it may be true, but in the ordinary meaning that the microbes of the air must be present it was not true, as must be admitted by those who have seen the formation of a felon under the periosteum of the bone.

Dr. Barrett thought it was scarcely necessary to enter into argument of that question.

Adjourned.

(To be Continued.)

AMERICAN DENTAL ASSOCIATION.

Second Day—*Evening Session* (Continued).

(Continued from page 771, Vol. xxix.)

Section VI, Physiology and Etiology, was called, and Dr. H. A. Smith, chairman, reported two papers, by Dr. Louis Ottofy and Dr. C. N. Peirce, respectively.

Dr. Smith then read a communication from the Section, rehearsing the action of the association some years since with reference to the award of a prize of two hundred dollars for the best essay on the Etiology of Dental Caries, and submitting a resolution to transmit that amount to Dr. W. D. Miller, Berlin, Germany, the author of a paper which was decided by the committee having the matter in charge to be entitled to the award. The resolution was adopted unanimously.

The resignation of Dr. C. H. Land, Detroit, as a member of the association was accepted.

Dr. W. N. Morrison offered the following resolution, which was at a subsequent session referred to a committee consisting of Drs. A. O. Hunt, Geo. H. Cushing, and A. L. Northrop, who are to report next year as to the advisability of making the offer:

Resolved, That a prize of five hundred dollars ($500) be offered by this association for a dental cement which shall most nearly approximate gold in resisting the action of the secretions of the mouth, and most nearly approach the color and non-conductive properties of the natural teeth; that it be offered for five years, and be open to all competitors in every country.

Adjourned to 9 A. M. to-morrow.

Third Day—*Morning Session.*

The association met pursuant to adjournment, President Allport in the chair.

After the transaction of routine business, the special order, the selection of the next place of meeting and the election of officers, was disposed of as reported in the September (1887) Dental Cosmos.

Dr. Atkinson moved that five hundred dollars be appropriated for the use of the Section on Dental and Oral Surgery in the Ninth International Medical Congress. Lost.

Section VI was again called, and Dr. C. N. Peirce, Philadelphia, read his paper, which was entitled "The Deciduous Teeth: Their Eruption and Removal."

[This paper will be found at page 1, current number of the Dental Cosmos.]

Dr. A. O. Hunt, Iowa City, Iowa, thought the writer of the paper seemed to be somewhat in doubt as to whether eruption was the best term to describe the entrance of the teeth into the mouth. A better might be found in the word "emergence," as eruption carried with it the idea of a violent disturbance, and ought to signify a pathological rather than a physiological change.

Dr. T. W. Brophy, Chicago, thought there was an excellent opportunity for the Section on Nomenclature to show its capacity by inventing a proper and satisfactory term.

Dr. Frank Abbott thought, if his theory of the projection of the teeth into the mouth was correct, the term "projection" would be the best to describe the process. It was difficult to know how the teeth were pushed forward to their positions, but he thought there would be no further development if the growth of the root were stopped before its completion. The process of the absorption of the roots of the temporary teeth was vexing to many. It was claimed by Tomes and others that it was a special process, some deposit—which he calls osteoclasts—eating away or destroying the root. The speaker did not believe anything of the kind. Another theory by Tomes, which he also questioned, was that the absorption could not be due to the pressure of the permanent teeth, because the process might commence at a point which was not the nearest to the coming tooth. This might be true in some cases, but they were exceptional. He believed the process was a physiological inflammation, due to the near approach of the crown of the permanent to the root of the temporary tooth.

Dr. Hunt wished to know how to avoid confusion in the use of "projection," as in the case of irregularity.

Dr. Abbott. That would be protrusion.

Dr. W. P. Horton, Cleveland, O., thought that inasmuch as every one from the time he began his studies had used the term "erupt," they would all understand just what was meant by it. He apprehended that the writer of the paper might have obtained his doubts as to which set was first evolved from exceptional cases. Within the past year he had seen a case where a gentleman of thirty had both superior temporary cuspids in good condition, with no signs of their permanent successors. He had also known a family in which three daughters, at ages ranging from seventeen to twenty-three years, still retained their first superior molars, the bicuspids never having erupted. He agreed with Dr. Abbott that the presence of the permanent successors was necessary to the absorption of the roots of the temporary teeth. He had known two other cases of the retention of temporary cuspids in the mouths of patients over twenty-five years of age, where there were, apparently, no germs of the permanent teeth. But these were exceptional cases. Usually, in cases of retarded development of the permanent teeth, they would be found mal-placed in the jaws; and in such instances it was a fair deduction that had they been in their proper position they would have been erupted.

Dr. Abbott. The writer of the paper took exception to the position of Tomes that absorption would take place at the end of the root and some other locality possibly, and stated that it would begin at the end of the root and continue toward the crown. This was

true when the permanent tooth came directly under or over the temporary root; but if it came against the side of the root, the side would be absorbed instead of the end.

Dr. Peirce replied that he had stated that when the absorption began on the side it rarely progressed to completion from that point. Perfect absorption must commence at the end of the root.

Dr. How suggested the word "advance" as a substitute for "erupt," as describing the whole process. The tooth could not be said to erupt or project until it began to appear through the gum.

Dr. E. T. Darby, Philadelphia, thought that neither "project" nor "advance" conveyed the idea desired. "Erupt" and "emerge" meant something.

Dr. W. B. Knapp, Fort Wayne, Ind., thought Dr. Peirce made a great error when he said that absorption could not be completed when it began at the side of the root, as many such cases had been observed where the root was all absorbed except a mere shell on the opposite side of the tooth from where the process commenced, the apex remaining after the canal had been passed much nearer to the crown.

Dr. Atkinson thought they were talking about results as causes. Very few teeth began to absorb at the apex. As to the proximity of the crown of the permanent tooth being the immediate antecedent of the retrogressive metamorphosis of the root of the temporary, that was all gratuity. All that was known was that there was a melting of the lime-salts and their conversion into the embryonal condition of the carneous body, which was but the converted remnant of the original pulp of the tooth. The paper was an admirable one, but overloaded with assumed facts "not proven." That roots of permanent teeth deprived of their pulps took a different course in solution from the temporary roots, was not true. He had treated permanent teeth with one-third to one-half of the roots absorbed, and so far as he could discriminate they had passed through exactly the same process as the roots of the deciduous teeth in the physiological absorption that preceded the coming of the permanent teeth. He had often said that there were thousands of patients carrying latent abscesses that were kept quiescent because of the condition of the blood-crasis. We should not attempt to decide things that did not decide themselves.

Dr. S. H. Guilford, Philadelphia, had hoped to hear some of the points suggested by Dr. Peirce's paper brought out in the discussion. One of these was in relation to the original typal form of each tooth. Tomes says the typal form was a cone, while Wedl claims that it was a wedge. To reconcile these ideas it was only necessary to consider the wedge as a series of cones. Assuming that the cone

was the original typal form, the question arose how to account for the different classes of teeth found in the human mouth and the breaks between them. The younger Tomes accounted for the break between the lateral incisor and the cuspid by assuming that in prehistoric man there was a tooth situated between these two, intermediate in form; and others have thought there must have originally existed a third bicuspid, or more properly a tricuspid, between the second bicuspid and the first molar. Dr. Peirce and Dr. Wortman think the first permanent molar is a persistent deciduous tooth, because it resembles the second deciduous molar in form. The deciduous superior second molar had four cusps, the first permanent the same number, while the second permanent had (they claimed) but three, in which particular it resembled the third permanent molar. This did not seem to hold good. While the second superior permanent molar was sometimes found with three cusps, it nearly always had four. In the lower jaw the second deciduous molar had five cusps, the first permanent five, the second permanent four, and the third permanent five. It seemed to him that the first permanent molar and the second were so nearly alike that they need go no further to settle the question. Each had four cusps, while the third had only three. He could not see, so far as form went, that there was any good ground for the idea that the first permanent molar was a persistent deciduous tooth. It used to be thought an intermediate tooth, and was consequently frequently sacrificed to gain room for the permanent teeth. The second reason given for classing this tooth with the deciduous was its time of eruption. But if the periods of eruption of all the teeth were studied closely, it would be found that the first permanent molar was more closely allied to the second set in this particular than to the first.

Dr. Peirce was perfectly aware that Dr. Black had shown that there was no difference between the absorption of a permanent tooth and that of a deciduous root; but he wanted to be explicit in the statement that a permanent tooth which has lost its pulp, and then through absorption its root, produced by alveolar abscess around the apex, presents a decidedly different appearance from a deciduous tooth which had lost its root through physiological absorption.

Section VI was passed.

Dr. Harlan announced that Dr. C. C. Carroll, of Meadville, Pa., would give a clinic in the afternoon on the working of aluminum as a base for artificial teeth.

Adjourned to 8 P. M.

(To be Continued.)

SOUTHERN DENTAL ASSOCIATION.

Fourth Day—*Morning Session* (Continued).

(Continued from page 778, Vol. xxix.)

The Committee on Pathology and Therapeutics was called, and the chairman, Dr. W. C. Wardlaw, Augusta, Ga., read a paper entitled "Neuralgia: Its Association with Dental Lesions." The writer's effort would be to show that a large majority of the neuralgic pains about the face and head had specific causes, and that these causes were "dental lesions." His limitation of the term neuralgia would be an abnormal condition manifesting itself in a portion of the system where there was no actual lesion, but a pain caused by irritation of a nerve, not at its termination, but at an antecedent point of its course, or by reflexion of an irritation from some other nerve. Most of the neuralgias to be considered were of the latter class. The paper then briefly reviewed the conditions, causes, and symptoms of neuralgia, passing from this to the consideration of those severe and flitting pains manifesting themselves in the eye, ear, cheek, forehead, lower jaw,—in fact, all parts to which the fifth nerve is distributed,—and called for convenience "facial" neuralgia. Fully three-fourths of these cases, as well as many instances of neuralgia of the shoulders, arms, and head, were due to dental irritation. A consideration of the anatomical structure and physiological relations of the parts, and especially of the fifth pair of nerves, whose ramifications constituted a perfect net-work of nerve-telegraphs, would show how easily a painful impression could be conveyed between widely-separated points. The current of sensation flowed from without inward, the nerve-trunks transmitting only impressions peculiar to their sentient extremities, and the brain taking cognizance of and referring a stimulus anywhere along the course of a nerve, not to the point of irritation, but to the part to which the terminal filaments are distributed. Thus, if the little finger was burned, the pain would be conveyed along the ulnar nerve, to acquaint the brain with the location of the lesion; and so, too, a prick upon these nerve-fibers at any point of their course would be recognized as coming from the little finger, and not from the point pricked. And an impression switched off, say from the radial nerve to the ulnar, would likewise be referred to the little finger. So, too, if an irritation from the gravid uterus should manage to get upon a dental nerve, there would follow the sympathetic toothache of pregnancy. An edentulous patient may suffer from toothache through pressure of a plate upon the gums. Having demonstrated the possibility and manner of a neuralgia of the fifth pair of nerves at any point from a dental irritation, the dental lesions which caused it were

to be considered. Some of these were: First, an exposed pulp may cause not only toothache, but neuralgia of the ear, cheek, etc., even though the exposure be so obscure as to excite no suspicion of its existence; an upper tooth may ache from a lower, and vice versa, or several teeth may ache from a single exposure. Second, pulpless teeth probably induced more neuralgias than any other dental irritation. The chronic condition of a pulp which has died spontaneously was more provocative of neuralgias than the acute irritation of pulp-exposure, and a tooth whose vitality has been destroyed by accidental violence was oftener the source of such troubles than one whose pulp has died after filling. Third, neuralgias were often associated with deep-seated caries, particularly the kind which contained leathery dentine. Even superficial caries, the acidity of the saliva, by increasing the sensitiveness of buccal cavities, was sometimes accompanied by neuralgia. The writer had traced neuralgia to the presence of gold and amalgam in the same cavity, and it might follow contact of different metals in adjoining or antagonizing teeth; but this was probably not a frequent cause. He believed he had experimentally proved that the presence of tartar was an exciting cause, and the denuding of the cementum by recession of the gums was an indubitable cause. Wisdom-teeth impacted in the ramus were not infrequently the source of neuralgia; as were, likewise, roots of teeth, exostosis, calcification of the pulp, and mercurial salivation. Any or all of these may be the palpable or obscure cause of this painful and troublesome malady. In diagnosing the lesions responsible for given neuralgias, Dr. Wardlaw said it was his custom to look for the source of earache in the lower third molar, sometimes in the second, and occasionally in the first. Lesions of the superior molars induced headache,—more or less constant,—and acute pain about the supra-orbital notch and near the frontal suture. Pain in the cheek and infra-orbital region was apt to be induced by lesion of the bicuspids, and the popular idea of a connection between the cuspid and the eye seemed to be borne out by the frequent occurrence of neuralgic pains in the eye when the "eye-tooth" or the first bicuspid was diseased. He had known neuralgia of the posterior scalp and the shoulder to proceed from a dead lateral.

The treatment of neuralgia has been as varied as the extent of the materia medica. The principles would, however, seem very simple,—radical or palliative. The former was nothing more than discovering and removing the cause. The cause removed, the effect would cease. Palliative treatment was directed to the immediate and temporary relief of pain, and consisted in the use of anodynes, liniments, emollients, and counter-irritation. Chloroform, ether, aconite, the essential oils, etc., entered into most of the prescrip-

tions. Bromide of potash, chloral, and morphia would all be found useful adjuncts in controlling systemic effects. In the periodical type, quinine was, of course, the sheet-anchor. Bisection of the trifacial was never necessary in pure facial neuralgia from dental irritation, though exsection of the inferior dental nerve was sometimes required in extreme cases where extraction did not avail.

Dr. J. J. R. Patrick, Belleville, Ill., was allotted time for a lecture on irregularities. To illustrate his subject he had constructed a monster working model of the superior human jaw, with a Patrick regulating bow-spring in position. The teeth were so arranged that they could be instantly adjusted in any position occurring in cases of irregularities. He said it was easier to talk of irregularity of the teeth than regularity; it was easier to define irregularity than regularity, because it was found in attempting to describe regularity that there was nothing regular under the sun. There was no species of animal in which there was not found such a shading off at the edges as prohibited its exact classification. Irregularity touched at one side on monstrosity; at the other on variation, so that it could be located, but when we came to regularity it could not be exactly placed. Artists have to take one part from this individual, another from that, and thus they have constructed a model of the human form so perfect that no representative of it existed in nature. No two individuals of the same species were exactly alike; that was variation. Irregularity was just beyond this, caused by a slight interference with the developmental forces. But when the interference went still further, through abnormal lack or excess of developmental force in one part or another, monstrosity resulted. Variation, irregularity, or monstrosity commenced in very early life. No other part of the body had so many centers of development and nutrition as the human teeth, each of its parts having its separate center; so that lack or excess of force in one or the other would readily produce, according to its degree, variation, irregularity, or monstrosity. Each part must grow with equal pace to meet its fellow, and at the proper time stop its growth to produce uniformity. There were fourteen bones in the face besides the teeth. Between the bones and the teeth there was a marked difference in the manner of development. The bones calcified from the center outward; the teeth from the periphery inward. Keeping in mind the differences, the wonder was that there were not more irregularities. Every deciduous tooth brought up its own process, and every one was thrown off when it had served its purpose, just as the shell of the crab or the horns of the stag were shed. They were not absorbed. For absorption there must be a special organ. He liked the term "exuviate," as it better described the process. Twelve

years were allowed by nature to get rid of the deciduous teeth, which were barely formed before they got ready to exuviate. They brought up their processes with them, as he had said, and were succeeded by the permanent teeth. The deciduous teeth were smaller anteriorly and larger posteriorly than their successors, a fact which considerably weakened the myth that they were guides for the permanent teeth. Some have maintained that there was an absorbing organ which consumed the deciduous teeth. If so, what became of it? There must be another to absorb it or the permanent teeth would never have a chance. The existence of such an organ was not susceptible of proof, but there was a process of exuviation going on all the time. The deciduous teeth had no more to do with the development of the permanent than with the growth of the toe-nails. Anthropologists classified the negroes and the bushmen of Australia as the most prognathous races; the Europeans and other whites were orthognathous. He had never seen a prognathous negro child with the deciduous teeth in the mouth. The fact was there was no prognathism in children; they became prognathous with the growth of the second set of teeth, and the condition arose from the difference in the size of the teeth.

[Dr. Patrick's address was illustrated also with a large number of finely-executed drawings, showing not only the common forms of irregularities in the teeth and jaws, but many which are only rarely met with.]

Dr. W. H. Atkinson, New York, objected to the term exuviation. The difficulty was that the process of the removal of the deciduous teeth had not been understood any more than inflammation. It was a return to the embryonal condition, and the kidney was the leach to carry off the ash.

Dr. Patrick. Absorption was indefinite, and didn't mean anything unless it was qualified. There was an external absorption and an internal absorption; the one constructive, the other destructive. When one says exuviation, all know that he means a physiological process in opposition to a pathological change.

Dr. Atkinson denied that there was external absorption. All nutrition was external till it got into the channel which carried it to its destination. Epithelium was first differentiated in the form of round cells, which afterwards became cylindrical, then cuboidal, and were then compressed, and the product was called pavement epithelium. In the absorption of the deciduous teeth the lime-salts were melted out and carried away.

The annual election of officers (previously reported) then occurred, after which the association adjourned till 8 P. M.

Evening Session.

The association met at 8.30 P. M., President Thackston in the chair.

The Committee on Pathology and Therapeutics was again called.

Dr. D. Genese, Baltimore, Md., related the case of a lady who had been under treatment for neuralgia by several physicians. Five good teeth had been extracted to give relief from the pain. The paroxysms would come on at night, accompanied by fever and depression of spirits; sometimes it was difficult to locate the pain. He made a sedative application—extract of white poppies spread over the gum—and made an appointment to see the patient the next day. She had the first good night's rest in four months. He was convinced that the cause of her trouble was a dental lesion, and on separating between the bicuspids softened dentine and an exposed pulp were found. A temporary capping was put in, and there had been as yet no recurrence of the pain.

Dr. R. Finley Hunt, Washington, D. C., differed in some particulars with Dr. Wardlaw; particularly with his statement that neuralgia was produced, as a general rule, by lesions of the dental structure. Dr. Wardlaw spoke of pure neuralgia. The speaker considered that pure neuralgia existed without special local lesion. There were systemic conditions, as in indigestion, in which there were pains in different parts of the body. He had known cases where the teeth were in fine condition, and neuralgia was caused by a small deposit of salivary calculus. It was sometimes produced by excessive smoking, when the cure was to remove the cause by limiting indulgence in the weed.

Dr. L. G. Noel, Nashville, Tenn., read a paper on "The Etiology of Caries of the Teeth viewed from the Stand-point of Physiological Chemistry." Dr. Noel considered that the work of Magitot, Miller, and Watt could be harmonized, and that thus the true theory of caries would be evolved. The whole story could be told in one word—catalysis. An example was the diastase of fruit, which converted the starch into glucose. A similar ferment in the saliva—ptyalin—produced a similar effect upon starchy foods, facilitating deglutition and the function of taste. Pepsin, the digestive ferment of the stomach, transformed albuminous matter into peptone. Its action, like that of ptyalin, was purely catalytic. Caries may be likened to the digestive process. Food capable of being transformed by the ferments and acids having access to it was lodged in the fissures and about the gum-borders on the buccal and labial surfaces of the teeth. The fungi found in carious cavities appeared to be only a growth of the catalytic substance. Ptyalin was powerless to produce glucose from raw starch. No glucose was found in the mouths of herbivorous animals accustomed to take their foods

raw; nor was caries found among their teeth. The pancreatic ferment also operated through an acid menstruum, and it was far more potent in transforming starch into glucose than the saliva, as was shown by the digestion of raw starch by the herbivora. In all these digestive or solvent processes mild acid fluids containing a ferment were found. Is it difficult to see the analogy to what occurs wherever food may lodge about the teeth and undergo decomposition? Is it difficult to conceive of these mild acids acting upon the enamel in places of habitual lodgment? Need we throw out of the count such proof as Watt adduced of the origin of mineral acids from decomposing alimentary substances? The teeth possessed only feeble vitality, but this was all that stood between them and destruction. The teeth of the savages were subjected to many of the same destructive agents that preyed upon the teeth of civilized races, but they were protected by better inherent structure and more enduring vitality. We have but to furnish sufficient and properly prepared aliment to restore to our teeth their lost function; observe proper hygienic habits, and the race would develop the ideal skeleton and teeth.

Dr. J. Rollo Knapp, New Orleans, read a paper, entitled "Are We Justified in Promising Success in Replantation?" by Dr. J. B. Hodgkin, Washington, D. C.

The paper reported a case typically favorable for replantation. A boy of thirteen years, fairly vigorous, and of apparently good constitution, with teeth perfectly sound and healthy, with no gum trouble, had the upper centrals knocked out by a fall. The sockets were syringed out and the teeth washed with carbolized water, and replaced within a half hour; held in place by a gutta-percha splint over the head and chin, and a vulcanite splint was made a few days later. A month later the pulps were apparently alive, and the teeth tight and painless; but in six months the pulp of the right central was dead, and a little more than a year after the accident both teeth were extracted, after considerable effort to make them comfortable. Replantation had been a success over and over, but its failure here made the writer hesitate about making promises over the result of such operations.

Dr. W. H. Morgan, Nashville, Tenn., reported the result of the experiment to show the action of ammonia fumes on gold, which Dr. G. H. Winkler and he had tried. A sheet of No. 5 "1000-fine" cohesive gold foil was rendered non-cohesive; another sheet of Globe foil, extra-cohesive, was only partially affected.

Dr. Winkler thought the experiment had not been wholly satisfactory to either party.

Dr. H. E. Beach, Clarksville, Tenn., thought the best way to find

out the difference between cohesive and non-cohesive foil would be to get the manufacturers to tell what they did to make it non-cohesive. He did not know whether this property was due to ammonia fumes or to the evaporation of water. Gold could be rendered non-cohesive with water.

Dr. W. N. Morrison, St. Louis, wished to say a word on the subject of replantation, which he regarded as a legitimate operation, having had many cases in which he had performed it. He had a case similar in many respects to that reported by Dr. Hodgkin, but the root-vessels were entirely removed, and the tooth filled. It was now in good condition, except at one side, where there was some absorption, and it was twelve years since the operation was performed. He thought the trouble in this case was probably due to lack of care of the gum over the root of the replanted tooth; that if it had been often brushed or rubbed carefully, there would have been no trouble. In Dr. Hodgkin's case the mistake was in not removing the root-vessels, and in not preparing a proper splint to hold the teeth perfectly quiet from the start. He felt grateful to Dr. Younger for introducing the operation with which his name was so indissolubly connected, more especially as it strengthened his own position with regard to replantation.

Dr. D. R. Stubblefield, Nashville, Tenn., read a paper entitled "Plain Histology of Hard Tooth-Structure." The author disclaimed any title to originality, and stated his intention to be merely the presentation of the results of the latest investigations in the histology of the dentine, enamel, and cemêntum in a clear, concise manner, in order to a better understanding of the subject by the great mass of dentists who do not make it a special study.

Adjourned, to meet on board the boat which was to convey the members intending to attend the Section on Dental and Oral Surgery of the Ninth International Medical Congress to Washington.

Fifth Day.

The association convened pursuant to adjournment on board the steamer Jane Moseley, President Thackston in the chair. The session was brief, and was devoted principally to the dispatch of routine business, which the pressure upon the time of the association had carried over.

Dr. G. W. McElhaney offered an amendment to the constitution, which was laid over for action next year, providing that the executive committee shall consist of six members, two of them to be chosen at the first meeting after the adoption of the amendment to serve for three years, two for two years, two for one year, and thereafter two members to be elected annually to serve for three years.

The usual votes of thanks were adopted. Among those thus remembered were the Virginia State Dental Association, for its magnificent hospitality; Mr. J. W. Selby, of The S. S. White Dental Manufacturing Co., for his constant care in providing for the welfare of the association and the comfort of those in attendance; and Drs. Moore, Parramore, and Woodley, of the Virginia Association.

A committee, consisting of the treasurer, Dr. Lowrance, the secretary, Dr. Dotterer, and Dr. Knapp, was appointed to procure a gavel to be presented to the retiring president as a memento of the meeting.

The committee for the collection of relics, consisting of Drs. Chisholm, Knapp, and Wright, was re-appointed.

The newly-elected officers were installed, the president, Dr. Catching, and the first vice-president, Dr. Prewitt, responding in brief addresses.

Dr. Prewitt moved that the paper read by Dr. Parramore on the application of the sponge-graft to the treatment of diseased pulps be sent to the Dental and Oral Surgery Section of the International Medical Congress, as a contribution from the Southern Dental Association. So ordered.

The association then adjourned.

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The Virginia State Dental Association, with open-handed hospitality, had chartered the steamer Jane Moseley, and extended an invitation to all in attendance upon the Southern Association who wished to be present at the sessions of the Ninth International Medical Congress, to make the trip, from Old Point Comfort to Washington, as their guests. Over three hundred availed themselves of the privilege, and many ladies added to the pleasure of the occasion by their presence. Lunch was served on board, and social enjoyment made the time fly rapidly and merrily.

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting, Tuesday evening, October 11, 1887, in the Hall of the New York Academy of Medicine, No. 12 West Thirty-first street.

The vice-president, Dr. J. Morgan Howe, in the chair.

The minutes of the last regular meeting were read by the secretary.

Dr. W. H. Dwinelle. The clamp referred to in the minutes of our last meeting, wherein a portion of its side was turned inward to rest upon the crown of the tooth to prevent it from interfering with and irritating the gum, was described and illustrated in the April number of the Dental Cosmos, 1877. I say this not for the purpose of re-

flecting upon the one who presented it to us, because I believe in the "coincidence of discovery." I believe it is possible for the same device or discovery to be made almost simultaneously in different parts of the world; that when the fullness of time comes and the world is in need of a particular discovery, different minds are inspired to invent and demonstrate it to fill the need.

Dr. Brockway. I do not know that I understand the particular principle of the clamp that was exhibited at the last meeting, as I was not present, but I have used clamps for many years which are made so as to prevent them from slipping down upon the gum. They were made for me by Mr. Biddle, who obtained the idea from Dr. Varney, I think.

The President. Perhaps many of us have observed that the case of undue prominence of the upper jaw, with models, presented from Dr. Colignon, of Paris, at our last February meeting, has called out the description of a similar case, successfully treated, by Dr. W. H. Barrett, of Paris, which appeared in the DENTAL COSMOS of August last. In both these cases the lower incisors struck against the gum posteriorly to the upper incisors. Dr. Colignon first attempted to drive the lower incisors down into their sockets by inserting a plate which would cover the hard palate, so that the lower incisors would strike it, and the upper and lower molars and bicuspids be prevented from touching; after six months or more he said "the lower incisors appear to have sunk in the alveolus and the molars to have elongated." Next, the cuspids were carried laterally outward by a screw-plate, so as to gain nearly a centimeter of space between them, which was followed almost immediately by the bite being changed. The lower first bicuspids had been closed back of the upper first bicuspids; now they were closed normally, one cusp farther forward. The bite was "jumped." In the case Dr. Barrett reports, he first moved the anterior upper teeth, which would not permit the lower jaw to be closed as far forward as normal, and then he introduced a plate covering the hard palate, on which the lower incisors struck in such a way as to urge them forward, while the upper and lower molars and bicuspids were prevented from touching. During three or four months of this treatment the lower teeth gradually assumed their normal antagonism with the upper. Dr. Colignon's case was explained as a *forward movement* of the jaw. As I understand it, the condyles were supposed to have been pushed back in the glenoid cavity, and they moved forward to a normal position when the bite was "jumped." Dr. Barrett thinks this explanation is incorrect. He expresses the opinion, in the article referred to, that the angle between the body and ramus of the jaw was changed by the action of the masseter muscles, in

closing the jaw, while the molars and bicuspids were prevented from striking; that it "changed the shape of the lower jaw," causing the lower front teeth to advance nearly to their normal position when they slid over the upper teeth, and the bite was "jumped." This explanation of such a change in the articulation was made by Dr. F. Coar, of Cologne, in 1884. In the DENTAL COSMOS for March of that year, page 190, Dr. Coar gives an account of his treatment of this mal-articulation, by means similar to those adopted by Drs. Colignon and Barrett. Dr. Coar also believed that the shape of the jaw is changed, the angle enlarged, but does not refer to any change in the temporo-maxillary articulation. This is so important and interesting a subject that we hope more facts and comments may be elicited. The executive committee will be thankful for contributions to the society by any one interested in the subject.

Dr. William Jarvie. Some years ago Dr. Kingsley presented a model before this society of just such a mal-articulation as that described by Dr. Colignon, and which was entirely overcome by "jumping the bite," the lower jaw being brought forward. This result was accidental, I believe, rather than premeditated. In my own office we had a case in which we accomplished it in a comparatively short time by making a plate to fit over the upper molars and building inclined planes for the teeth to strike upon, so that the lower jaw was constantly being worked forward.

Incidents of Office Practice.

Dr. J. W. Clowes. A prominent member of my profession once said to me, "I believe the extraction of sixth-year molars to be *sometimes* good practice. I have a young lady patient at this time whom I consider a fit subject for the operation, but her mother will not consent." I offered to assist him in gaining compliance, if he would bring the mother and daughter to my office. He did not come himself, but sent them with a letter of introduction. I found the mother to be a lady of rare intelligence and quick perceptions,—in fact, one of that sort of "ignorant" people whom I have recently been credited with easily persuading. Having seated the daughter in my chair, I examined her teeth and presented my views as to what should be done. The mother listened attentively to my argument, gave ready assent to my advice, and expressed an earnest desire to have the needed extraction performed. I gave an order to that effect, and it was carried out that very day. It may seem that I should have been astonished at this ready yielding to a half-made effort, but I was not,—for only the expected and the accustomed had come; a few simple truths had been uttered, and they won, as they will always win when intelligently received. While writing the order for extraction, I remarked that it should have been done

a year earlier; when the lady surprised me by saying, "About that time I inquired of my dentist if it would not be well for my daughter to lose some of her teeth to lessen their crowding. He looked them over carefully and said, 'I think it would be well, but am not certain whether they should be molars or bicuspids.' He added, 'I will call another dentist and get his opinion.' The other one soon came in,—a venerable and pleasant gentlemen,—and they consulted together and concluded that some extraction ought to be done, but could not decide what teeth they should be. They agreed, however, that nothing should be done in less than a year." Does any one see why my dental brother could not get the lady's consent to the extraction of her daughter's teeth? Half-hearted expression and vacillating opinion deferred relief, and the opportunities of a twelve-month were wasted by inaction. Scarcely a week had passed after the extraction, when the mother appeared suddenly before me. With flushed face and looks of excitement she exclaimed, "Oh, Dr. Clowes, they say my daughter has had out the wrong teeth!" I knew who "they" were and thought them miserably employed in frightening a trusting soul! "My dear lady," I said, "do not be troubled; the wrong teeth have not been extracted; the right thing has been done. Neither the advice nor the action was an experiment with me. The practice of many years has shown their worth, and time and results will demonstrate it to you. Besides, there is no reversal now; your daughter must have good and regular teeth, and nothing can prevent it!" The dentist who sent his patient to me for advice is one of us. Honored here and respected in the field of his labors, he has witnessed already before you that the good I promised has come to pass. Let us hope, if in anything he lacks strength, he may be strengthened; if of anything *uncertain*, he may become assured, steadfast, immovable in the right.

Dr. Dwinelle. I have here a plaster cast of a giant jaw. When I first saw the subject of it, a negro servant of mine, he had thirty-four teeth. This model will show thirty-three, and the place where the other one was extracted. It is a rather unusual case, and interesting because of the gaint proportions more than for anything else. The model shows the tongue as well as the jaw, the latter being nearly twice the dimensions of the ordinary maxilla. I was under the impression that another subject involving artistic dentistry was to be discussed this evening; showing to what a large extent the form and expression of the face is subject to our art. I therefore have brought two plaster casts that may be interesting in that connection,—one showing the profile of a patient before the teeth were regulated, and the other after. As Shakspeare

once remarked, "Look on this picture; then on that." This was one of those V-shaped upper jaws, the teeth projecting so that it was impossible for the lips to cover them, the patient constantly drooling from the mouth. The upper jaw was both narrow and sunken, the upper lip shortened and drawn upwards, giving a peculiar and disagreeable character to the expression of the face. In the course of time, after regulating the teeth, the lips were, as you see in the second model, capable of covering the teeth. The upper jaw was expanded and broadened, the projecting teeth drawn in, and it is now a normal, well-formed jaw, and the expression of the mouth, instead of being unnatural and repulsive, is normal and pleasing.

It is an old adage among physicians and dentists that we learn more from our failures than from our successes; and I will, with due humility, beg to present to your observation to-night one of my failures. The patient came to me with the right lateral of the upper jaw and the centrals adjoining badly decayed, the lateral having been dead for some time. I found that a hole had been drilled in the lateral just below the festoon of the gum where it joined the lip, opening the pulp-canal, and it had been discharging more or less for several years, giving a great deal of trouble. They limited me as to time, so I did not have opportunity to treat the tooth before building on a crown. I put in a screw, as large as a knitting-needle; made some undercuts; established my connection with the tooth, and built my crown. A few days afterwards it commenced troubling. I wanted to treat it by drilling through the gum to the extremity of the root, so that medicaments might be injected to the seat of the trouble. The lady finally consented to submit to the operation, but I had hardly touched the exterior of the gum when she shrank away from me, and nothing would induce her to allow me to proceed. She finally came to me one morning at four o'clock and insisted that I should take the tooth out. I declined to do so, but her husband pleaded that his wife was almost dead from suffering and want of sleep, and it was now only a question whether we should save the tooth or the life of his wife, and therefore I extracted the tooth. I gave her chloroform, and here is the tooth, gentlemen, I am sorry to say. I have no doubt I could have saved it if I had had the time and opportunity to do so.

I saw this evening, in the office of Dr. Lord, some gold pluggers of which I most heartily approve. I do so because I have approved of like instruments all my professional life. He showed me his filling instruments terminating in a truncated cone, and bent at an angle, which I have used for many years; but in addition to that he had cut on four sides of the point deep lateral grooves, which

answer the further purpose of an additional instrument. They are something like those invented by Dr. C. C. Allen, a number of years ago, having lateral grooves on the sides of the point, so that in rotating them you get great efficiency. Dr. Lord also showed me instruments of this nature that were serrated on the sides, so that they really represent three or four instruments in one. I am an advocate of the absolute point. Our worthy friend, Dr. E. J. Dunning, who has retired from practice, used instruments many of which terminated in a point, and his operations were quite in advance of many of those of his day. He read an article before the New York College of Dentistry, shortly after its establishment in this city, the subject of which was "Perception at the Point." Gentlemen, there you have the text for a sermon. It suggests a thousand things, many of which he demonstrated to us in a manner both practical and beautiful.

Dr. S. E. Davenport. This cast, which I shall pass around, is of the mouth of a patient about forty-five years of age, who lost most of his molars in his boyhood while residing on a farm far from suitable dental attention. We know that practitioners of years ago would almost invariably extract teeth which were painful, and often when only slightly decayed, it being, as they said, "only a question of a short time before they *would* ache." We hope there are none such now even in the "hayseed district." As a consequence of this wholesale loss of grinders, the patient has for years masticated his food almost entirely with the front teeth, which are now, as you will see by reference to the cast, somewhat worn and chipped, besides being pushed forward and spread out of position. There is also a very decided recession of the gums, and an appearance of approaching pyorrhea alveolaris, particularly about the incisors of both jaws. That an hereditary tendency to pyorrhea alveolaris exists is proved by my knowledge of the patient's father, who lost his teeth quite early in life, the loss being uninfluenced by caries.

Merely for the purpose of increasing the masticating surface, a gold suction-plate, to which were added two light clasps fitted around the second bicuspids, was made for the patient's superior jaw about one year ago, and has been worn with comfort for that length of time.

While treating the teeth recently for pyorrhea alveolaris, I concluded to try the experiment of adding to the plate gold wings or caps, swaged up over the ends of both the artificial molars and the natural bicuspids and cuspids, to open the bite a trifle, and thus relieve the incisors, both superior and inferior, from the hard knocks to which occlusion was subjecting them. Two pieces of pure gold, about

No. 30, were used for each side, first swaged separately, then one into the other, and joined with 18-carat solder to stiffen,—each wing being then soldered to the plate. The patient has already become accustomed to the plate as it is. He loans it for exhibition before us to-night, and while I am aware that it possesses no originality, it seemed to be sufficiently removed from our ordinary artificial appliances to deserve a place before this scientific body. My expectations are that great benefit will be derived from wearing this appliance. The incisors will have rest, and will spread and move forward no more; neither will they continue to break and chip at their edges, and I also expect that the inflammation about their roots will now be easily subdued. The mouth will probably be benefited later, if a partial lower plate is inserted to give more masticating surface. The upper plate could more easily be kept clean if the porcelain teeth were broken out and replaced with white vulcanized rubber, and that will probably be done. The question now arises in my mind whether a vulcanite fixture should not be made for night wear, so arranged as to leave the roof of the mouth uncovered and still open the bite, to avoid all danger of harsh contact of the incisors during sleep.

It seems to me that there are questions of importance connected with this case, the consideration of which will be advantageous to us all, for the case is but an illustration of a type which is constantly being presented.

Dr. J. F. P. Hodson. I would like to ask Dr. Davenport why he used both atmospheric pressure and the clasps? I should think one would work against the other.

Dr. Davenport. The light clasps assisted the patient in getting accustomed to the plate, preventing any loosening while the atmospheric pressure was being established. The swaging was so successful, however, that atmospheric pressure and the clasps are now dividing the work. The clasps if loosened are found not to be really necessary, but I think they assist.

Dr. Jarvie. These incidents of office practice, as they are related, sometimes become valuable for the questions that arise in connection with them, and I would like to ask Dr. Dwinelle a question in regard to the incisor that he has presented. The restoration with gold is very beautifully done; but would he, as an ordinary practice, deface the front of a lady's mouth by the display of so much gold? Could not the restoration of the tooth have been accomplished, so that it would be much more presentable and fully as useful, by means of a porcelain crown? I think a display of so much gold is a great disfigurement, particularly in the mouth of a lady. Possibly Dr. Dwinelle may not think as I do.

Dr. Dwinelle. I have already appeared before you arraigned as a criminal; nevertheless, such defence as I can make to you I shall. I heartily agree with Dr. Jarvie, but there are circumstances that I can give in explanation of the course I pursued. The lady preferred a gold tooth to any other; and the objectionable feature of the gold can be reduced to a great extent by toning it down and giving it a dead-gold color. Neither is it so objectionable when the teeth on each side of the one to be restored have that golden color that we often find,—a reddish-yellow, almost an orange color. If crowns are put on with a gold backing the porcelain is very apt to break away in mastication, which is especially unfortunate when our patients are far removed from us, where we cannot minister to them. I proposed to this lady that she should have a porcelain crown of some kind, but she insisted upon having gold, and though it may not reflect much credit upon me, I fixed the gold so that it would not reflect much in the lady's mouth.

The President. The subject of the evening is

THE COMBINATION OF METALS AS A FILLING-MATERIAL.

We have two papers, one by Dr. S. B. Palmer, of Syracuse, and one by Dr. C. T. Stockwell, of Springfield.

The secretary then read a paper by S. B. Palmer, M.D.S., of Syracuse, N. Y., entitled "Combination Metal Fillings." [See the DENTAL COSMOS for December, 1887, page 742.]

The secretary also read a paper by Dr. C. T. Stockwell, of Springfield, Mass., entitled "The Combination of Metals for Filling Teeth." [See the DENTAL COSMOS for December, 1887, page 733.]

Discussion.

Dr. Davenport. I have been much interested in both the papers read this evening, and am only sorry that the gentlemen who wrote them are not with us to join in the discussion. Dr. Stockwell stated that he preferred to combine "Robinson's foil," as he called it, and gold, rather than amalgam and gold, for the reason that he could then complete the operation at the same sitting. When it seemed advisable I have been accustomed to combine amalgam and gold in compound approximal cavities, completing the operation at one sitting. The method is to fit a band or other matrix carefully to the edges of the cavity, and fix it in place so firmly as to allow of considerable pressure being applied to the amalgam, which should be malleted in. The amalgam should be mixed very dry, and before the gold is applied tin-foil may be used to

take up the excess of mercury, if there be any, the tin being then scraped off. I am referring to compound approximal cavities only, as in cavities of that nature anchorage for the gold can be obtained in the solid tooth-structure of the crown. This is really reversing the usual order, anchoring the gold as it does in the crown, and extending it over the amalgam and against the matrix.

Dr. Dwinelle. The first knowledge I ever had of the combination of tin and gold for filling teeth was derived from Dr. Spooner, who practiced it in this city fifty or sixty years ago. He was an ornament to our profession,—one who shed luster upon it by his authorship of several exceedingly interesting works on dentistry and general literature. He was an honest man, and rendered his patients good service; nevertheless, in that early day he was accused of combining tin with his gold for economic purposes. But I believe he maintained that he did it for other and good purposes, which in this later day are seemingly about to be recognized. That gold will not always answer the highest and best purpose as a filling we admit, but in a large majority of cases it is the best material. There are circumstances when, for some hitherto mysterious causes, it does not answer the purpose, and it is possible that this mystery is about to be solved. We know that different materials affect the teeth differently, and at different times of life. We also know that teeth that have in ancient days been filled with lead have been well preserved; and that lead foil was particularly recommended for filling teeth more than sixty years ago. Perhaps it was not for this reason that its use was advocated, but we know that lead and its products are exceedingly sedative in their influence upon sensitive teeth. Tin comes next to it with the same qualities, at least in degree. We know that amalgam will often be successful where gold would fail. I can recall many cases in my practice where I have filled large molars again and again with gold only to find each time that the dentine would dissolve about the margins of the fillings, and ultimately I would be obliged to remove and refill with amalgam; the decay would then be entirely arrested, and the operations have been successful to this day. My theory was that the amalgam threw out a species of oxidation from its surface coming in contact with the fluids of the mouth, so that a sort of galvanic process was set up, which in time resulted in fossilizing the tooth-substance. In some cases where I have left a portion of the soft, partly decomposed dentine in the cavity, years afterwards, when I removed the filling, I have found that dentine not only fossilized and recalcified, but became hard and crepitous like glass.

The method of using gold and tin in combination is well recommended to us to-night, and I can see that the theory given is good

doctrine, and I have no doubt that good results will come from it. I have seen such good results, and I recall one case of old Dr. Spring of the Brick Church. He came to me a number of years ago and showed me a tooth that was filled with tin when he was a young student in Salem, Mass., more than a half-century before. It was then worn so thin that it was necessary to remove what little was left of the filling, but the tooth had been perfectly preserved. In some mouths tin will oxidize, and nothing but a gray powder will be left.

It has been supposed heretofore that it was desirable to avoid galvanic action in the teeth, but to-night one of the papers advocates it in tooth-fillings. It may be very well, but how shall we graduate the current and how shall we use it as a sanative measure? It seems to me that the matter is left without any definite conclusions, or, if conclusions, they are somewhat transcendental in their character. Nevertheless, I think we are under great obligations to the authors of both papers for their contributions to-night. They are exceedingly interesting, and I wish we had time to discuss them at length.

It has been suggested that the surface of an amalgam crown may be cut away and filled over with a veneering of gold. Why not let it remain; build up a dyke of wax around it, fill this with a solution of gold and gild it by galvanism. Then burnish, and you have a gold crown.

Dr. J. W. Clowes. While the papers and discussion this evening have fully demonstrated the importance of amalgam, I wonder greatly at the proclivity shown by some for mixing it with metals outside the prescribed formulas and proportions that give it excellence. As a salvator of the teeth amalgam holds no second place, and the record of its usefulness is without reproach. By this affirmance of its value let us show not only our approval, but our settled conviction of its comeliness as well as goodness. Let us go further and declare it better, more natural, and less obtrusive than the golden idol to which we have looked so long, and from which we have suffered so much. The people are more progressive regarding these things than the profession, and I confess to have often advanced my lines of practice and achievement through their suggestions and encouragement. A gentleman who had suffered a golden experience came to me many years ago for professional service. Having filled his badly-decayed molars with amalgam, I said, with expectation of approval, "Now, I will fill your front teeth nicely with gold." "Why gold?" came out of his mouth with a force that astonished me. "Because," I replied, "gold is considered best for appearance, and no one thinks of filling front teeth with anything

else." "I beg leave to differ with you, and prefer amalgam, because it approaches more nearly the color of my teeth. If you will use amalgam, I would like to have the work done." I agreed to his proposition with the remark that some day he would probably "come back and ask to have gold in its place." But he replied with much emphasis, "I never will!" To another gentleman in whose front teeth, above and below, I had been filling cervical cavities with gold, I exclaimed when partly through, "I am very sorry to hurt you so much, but don't know how to avoid it." As I fairly groaned out these words of sympathy they were met by the inquiry, "Why don't you fill them with amalgam?" His suggestion was adopted, and we enjoyed a mutual relief. Another patient came to have a lateral incisor built up with gold. This tooth had possessed a golden crown for several years, but when it came to my hands was in a perishing state, and I decided to permanently reconstruct it. To this end I cured an abscess at the apex of its root; established a screw firmly in its dentinal canal, and then built up its crown wholly with amalgam. I explained that this was the best way to make a strong tooth, and promised a week later to give it a front plating of gold. I scarcely dared to disclose my processes for making a gold tooth lest he should take fright at the prospect of going so long with an amalgam exposure, but in due time he came for its completion, and asked "why I wanted to plate it with gold." I gave the usual replies of better appearance, the popular liking, and his own supposed choice; when he declared he would be perfectly satisfied without the gold, and added, "I will tell you why. For several years I have had a gold tooth, and it has been a great annoyance to me. If I happened to meet a friend in the street, while shaking his hand he took a look at my gold tooth; while we conversed together, no matter how important the subject, he looked at my gold tooth; and when we said good-by, he took a farewell look at my gold tooth. Since you built up the amalgam crown, a week ago, no one seems to have noticed that I had a tooth of one kind or another, and I have felt so relieved that I resolved to ask you to smooth and polish what you have done and let it alone." Ten years have passed since then, and still in his chosen tooth he finds content. Even dentists may come in time to know that silver-white is a more intelligent preference than golden-yellow.

Dr. Hodson. Two thoughts came to me while listening to my friend who has just spoken, to which I would like to refer. One was that he seems always to proceed upon the hypothesis that, if a man is accustomed to using gold, he is also accustomed to hanging it out of the mouth in great nodules. I do not think that gentlemen of artistic tendencies do that. When teeth in the front of the

mouth are to be filled, an artistic operator will strive to conceal the gold, even to the point of qualifying the shape of the tooth; while if a large proportion of the front face is destroyed and gone, the same operator, in these days of so dependable porcelain crowns, turns to them for relief from this very display of inartistic "handicraft" dentistry which the gentleman ascribes to them. The other is the complaisance with which he allows his patients to direct him as to the manner of doing his operations. It seems to me that the dentist should be the power to judge of that, and the absolute judge, and if he considers amalgam to be the best thing for one individual operation, he should use it, and if gold he should use that. In regard to the excellent papers that have been read to-night, I am sure that we cannot withhold our general approbation of them, and our thanks to the two gentlemen who have written them. There are some points in Dr. Stockwell's paper, however, with which I should take issue. One is the building up of a great crown of amalgam, and then afterward putting a gold face on it, which I do not think would be any especial improvement, when the whole operation could have been done much better by placing an artificial crown upon the root. I cannot see why they should take all that trouble except for the purpose of experiment. Another thing is the application of Robinson's foil, or any other metal, to the bottom of a large cavity for the purpose of reducing the effect of thermal changes. It does not seem to me that, with our knowledge of methods for avoiding it, there is any real necessity for harmful thermal changes reaching the underneath of a metal stopping. My usual method is to treat the dry surface of the interior of a cavity with carbolic acid, and so make a non-conducting intangible lining to the whole cavity, varnishing the interior of the cavity, also, for the same purpose. Then, with the tangible interposition of a non-conducting substance between the pulp and the mass of metal stopping,—as, for instance, oxyphosphate of zinc or gutta-percha,—there seems to be not the least necessity for any harmful thermal changes; but I do not think it is proper to put *any* metal in contact with the floor of a very deep-seated cavity.

Dr. E. H. Raymond. There are many points brought out by the essayists this evening worthy of our consideration. The first is tooth-preservation and the restoration of lost masticating surface by the use of combination fillings. Of course, no one would use a combination of metals in any of the anterior teeth. That badly-decayed teeth can be made useful for many years by this plan many of us know by practical experience. The restoration is mechanical; but by such combination there is doubtless brought about electrical or galvanic action, which is no less a factor in the salvation of these teeth. If this is not true, why do we see these

teeth frequently which, having softened around our elaborate gold or carefully inserted amalgam fillings, when refilled with combined metals, become dense and resisting, and the disintegrating process cease? We cannot attribute the failure to defective manipulation. There is an *agency* at work through the medium of the metals, call it by whatever name we will. The next point of interest is the change which Dr. Stockwell thinks is brought about in the buccal fluids by this action, counteracting the destruction of tissue caused by micro-organisms. The "lightning kills them!" Good. Let us have more of it! Where there are organic substances in a state of putrefaction, which are frequently found between the teeth, we may well expect bacteria there ready for their work of demolition. When there are teeth adjoining one that has been reconstructed with combined metals, having their surfaces sufficiently acted upon by the solvent action of acids, and which are in a state to invite attack from micro-organisms, is it not an inducement on this account also to adopt the method, when practicable?

These questions may be considered with profit. I have many times patched amalgam fillings with gold, and gold with amalgam, but seldom if ever have had to "patch the patch."

Dr. S. C. G. Watkins. I have practiced the methods that have been described to-night for several years and to a considerable extent. It seems to be considered very advantageous to finish a filling with gold after partly filling the cavity with some other material, and my experience is that tin is better than amalgam for use in combination fillings. I have used amalgam in the manner described by Dr. Davenport; indeed, I described that method before the New Jersey State Dental Society about six years ago. As you all know, that portion of amalgam near the surface will contain more mercury than the center of the filling, and by cutting that softer part away gold can be applied to the denser portion of the amalgam and the filling finished at the same sitting. But it has been my experience that with fillings of that kind something gives way. It is usually teeth of a frail nature that are so filled, and when such a dense filling is put into a weak tooth it has always seemed to me to be a case of the stronger attacking the weaker; and often the edges of the tooth will give or break away from the amalgam, and failure, more or less complete, will be the result. Tin is of a soft and yielding nature; it can be inserted very quickly, and gold can be applied to it and the filling finished at the same sitting. When it is completed it will preserve the tooth, the edges will not break away, and in many cases it is a better filling than any gold filling that we can put in. I believe that many fillings are too dense for the teeth they are placed in, and that one of the advantages of tin is its softer

and more yielding character. When amalgam is malleted in, it becomes, when crystallized, as dense and solid as a rock. Somebody—I don't remember who—has recommended partly filling cavities with zinc-phosphate, and then applying and finishing with gold while the cement is still soft. I experimented with that method in two central incisors, about one-third of each being gone, and the pulps alive. I filled the cavities nearly full with zinc-phosphate; applied gold while the phosphate was soft and sticky, and built up the gold on that until the fillings were contoured. That was done a year ago. Both fillings are apparently in good condition now, but how they will wear I cannot say. It was a very simple operation, and the patient was greatly pleased. In regard to patching fillings, it is my practice, where they are not exposed to view, to patch gold with amalgam, and amalgam with gold. The question has been asked, "Did you ever patch a patch?" I never have. It is very noticeable in such cases of patching with another metal that there is no chipping, and the edges are very perfect. The edges of the amalgam do not chip; where there is any giving way, it is the tooth that chips.

With reference to Robinson's foil, I believe I was the first dentist in the State of New Jersey to employ that material, and I once gave a clinic illustrating its use before the First District Dental Society of New York. I used it to a considerable extent for a time, but have now discarded it almost entirely, and for the simple reason that tin will do everything that Robinson's foil will do. It seems to be the prevailing opinion that amalgam should be used in very soft and frail teeth, and one gentleman remarked this evening that he put gold in hard teeth. Now, it is my practice to put gold in soft teeth, and I believe that a soft tooth will stand a gold filling better than it will an amalgam filling; the amalgam is too hard and unyielding for the soft tooth, and when there is much pressure and strain the tooth will give way from the amalgam. I think the use of the rubber-dam in making amalgam fillings is of very great advantage. When it is used there will not be much discoloration of the amalgam. I have noticed amalgam fillings side by side, one made without the use of the dam and the other with it, and the one with which the rubber-dam was used had a bright and almost perfect color, while the one made without the dam, and receiving the moisture from the breath, was almost as black as ink. In Dr. Palmer's paper the method of filling with tin in connection with gold was described. The doctor stated that the cavity was *lined* with tin, which seemed after a time to be destroyed,—becoming a crumbly, pulverized mass. I think if the gentleman would fill the cavity with one-half or three-fourths tin and then build the gold on to cover all exposed parts,

he would find the filling after a few years in a perfect condition. There is certainly some kind of action when two kinds of metal are used in one filling. I do not know whether it is electrical or chemical, but I do know that, whatever it is, it is beneficial in saving tooth-structure. I want to ask Dr. Dwinelle what kind of amalgam that was to which he referred, where the softened tooth-substance became hardened under it. Did it not contain copper?

Dr. Dwinelle. It was the old-fashioned silver amalgam, made from the filings of Spanish milled dollars. I believe there is a little copper in them.

I wish to say a word in reference to this beautiful case which Dr. Davenport has shown to-night. I wonder if the idea did not occur to the mind of everyone who looked at the model that it was a pity that the sixth-year molars were taken out. They were taken out years before Dr. Davenport saw the patient, and the consequence is that there is no articulation or occlusion of the molars whatever. Nothing is left but two twelfth-year molars on one side and one on the other, and the articulation in the back part of the mouth is entirely broken up. All mastication has been performed for years upon the front teeth, resulting in their protrusion forward and outward, which condition has perhaps engendered the very disease he treated.

I move that a vote of thanks be extended to Dr. Palmer, of Syracuse, and Dr. Stockwell, of Springfield, for the contribution of their very interesting and entertaining papers read to us to-night.

The vote of thanks proposed by Dr. Dwinelle was passed.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

(Meeting of October 4, 1887.—Continued from page 790, Vol. xxix.)

President Walker. We have with us this evening several distinguished gentlemen from abroad, and the First District Dental Society cordially welcomes them, and invites them to take part in the discussion. I refer particularly to Dr. McLeod of Scotland, Dr. Wedgewood of England, and Dr. Grevers of Holland.

Dr. McLeod. Mr. President and Gentlemen: It affords me very great pleasure to meet with you this evening. I have listened to the paper that has been read with much pleasure and instruction, and I thoroughly indorse the sentiments expressed by Dr. Atkinson. There is not the slightest doubt that, if we wish our profession to rise to the dignity and usefulness which he has portrayed, we

can only hope to get there by mutual interchange of knowledge. We have in my country a noble example of such interchange of thought, although we are somewhat late in the day. The same movement for the common advancement of the profession that I see here is going on among us. We have several societies whose business it is to meet at stated times for the interchange of thought with one another. The latest association of this kind has not only a scientific, but also a political object. I am happy to say that the good which the dental profession in Great Britain has derived from these associations is beyond calculation. A branch of the association has recently been established in Ireland, and is exerting a marked influence for the good of our profession there. The forming of these associations has brought together men who had been practicing their profession thirty, forty, or fifty years in the same street, and yet had never spoken to each other. The gathering together of members of the profession in these meetings has broken down the strong barrier of selfishness and indifference that had so long stood between them, and now they seem as if they had known each other for a lifetime. Since the establishing of the branch in Ireland the profession there has taken a new lease of life, and as we know that Irishmen are gifted with many and varied talents, we may expect there will rise from among them some bright genius, similar to Dr. Younger, who will astonish the profession by fresh inventions or discoveries that may be directly traceable to the inauguration of this branch. I agree heartily with the idea that we should do all in our power to bring about a unity of the profession, and to discourage all proscriptive rights in inventions or any course of treatment whatsoever. I trust that on some future occasion I shall have the pleasure of visiting your society, to find it still holding its own in the march of progress.

Dr. J. E. Grevers. Gentlemen: I shall have to ask you indulgence, as I do not speak your language with any degree of perfection. I feel very much interested in the paper that has been read by Dr. Atkinson. In reading some of the old books on dentistry and surgery, I have found some very curious and interesting bits of literature. Dr. Atkinson stated that in former times dentistry was in the hands of the barbers; and I know that to a certain extent that was true in Holland. There is a certain reason why it has been in other hands than the surgeons'. One old writer upon surgery tells his brother surgeons that it is beneath their dignity to extract teeth, and injurious, because it makes their hands shake, and, of course, that was very bad for the surgeon. In some of the old books you find explicit rules how to extract teeth, and, with the crude instruments there described, it is no wonder that it was a somewhat bar-

barous operation. It is very interesting to read the works of Dr. Rau, a German writer about the year 1816, and to see the pictures of the instruments then used; we find some very good instruments shown there. The forceps we find at that time very nicely developed. In Holland we had not only the barbers practising dentistry, but to a very recent time dentistry in Holland was in the hands of the Jews. A lady came to a friend of mine for some operation, or for some artificial teeth, and she asked him, "Are you a Jew?" He said, "No, I am a Christian." She said, "I am sorry; I thought the Jews were the only real dentists." So you see that in Holland a dentist and a Jew are synonymous. But in the last ten years a new movement has been made by a few of the best practitioners in Holland; they meet together twice a year for the interchange of ideas and mutual improvement. It is a small country, and the distance to travel is not great. In your country here one may travel many hours in succession and think nothing of it, but with us two hours' travel is a pretty long time. As the result of these meetings, there is much improvement going on in operative as well as in mechanical dentistry. My mission to the United States is to pick up as many hints as I can to improve myself and my professional brethren at home. In this connection, I want to say that the clinical part of your meetings has been highly instructive to me, and for a good many years I will have things to think over concerning them. Another feature that I want to speak of is the kindness of the people of the United States in receiving a stranger and helping him along. They do not keep anything secret, but show one everything that he wants to see. It is not only for myself but for the people of Holland that I want the light, and I will try to spread what I have when I go back.

Dr. Wedgewood. Mr. President and Gentlemen: Four years ago I had, and now I have again, the pleasure of being present before your society. Although located in London, we are not, as Professor Bell said, five hundred years before Christ. We are progressing, as Dr. McLeod has stated. The British Association, the American Dental Society of Europe, and all the dental societies of Great Britain have been of great advantage to us in bringing together the members of the profession from all parts of the kingdom. And then occasionally we have to come over here to get new ideas. I came over to this country to see if I could find anything new to take back home with me. I was very much interested in the Congress; and my visit to Old Point Comfort was especially interesting and instructive. The meeting of the Southern Dental Association there was an excellent one. My friend, Dr. Younger of San Francisco, has brought before us some new ideas that will create quite a revolution in den-

tistry if his operations prove successful,—which I hope they may. I thank you heartily for your kind reception, and I hope it will not be many years before I shall have the pleasure of meeting you all again.

Dr. Abbott. Mr. President: It seemed to me, and I presume to many others present, very modest in Dr. Atkinson to give this society credit for establishing the first public clinic in practical dentistry. It will be remembered by the older members of the profession that some twenty-four or twenty-five years ago the gentleman himself inaugurated a kind of public clinic at his office by giving a general invitation to all who desired to come and see him perform dental operations. This, as far as I know, was the first break in the closed-office style of conducting a dental practice. To Dr. Atkinson is due the credit of this open communion, this free interchange of practical ideas, and the establishment of the public clinic of this society. I might also mention the fact that at the first session of the New York College of Dentistry a systematic clinic was established, to which not only the students of the college were present, but many dentists of the city and country around, who were invited, as a general invitation was extended to all. So the record stands something as follows: Dr. Wm. H. Atkinson, of this city, was the first to give clinics before his fellow-practitioners at his office some twenty-five years ago; the New York College of Dentistry was the first institution of the kind to establish and maintain a clinical staff of instructors twenty-one years ago, and the First District Dental Society of this city the first society to establish a clinic in connection with its monthly meetings. The "new departures" by the college and by this society were the legitimate fruits of the seed sown by Dr. Atkinson several years previously.

Dr. Dwinelle. Mr. President: Allusion has been made to the late International Medical Congress. I think the position of the Dental Section in that Congress was particularly creditable to us. While in the other sections the distinguished men from abroad—the best intellects and highest talent in the profession—had exerted themselves to frame essays, they read their best thoughts to audiences of from twelve to fifteen or twenty, while, to our credit be it spoken, the Dental Section was never attended by less than one hundred, and from that to four hundred and fifty. This difference became so manifest that it attracted the notice and attention of the people at large, and was especially mentioned in the public journals, and as a dentist I am proud of it.

With reference to what has been said by Dr. Abbott, I indorse it all. I have been in the profession several years longer than he has, and when I first essayed to enter it I was snubbed at every point.

I could not get information from anyone unless I paid a price altogether beyond my means. I stopped at a city in the northern part of this State, not a thousand miles from Albany, and went in search of information. I had a limited amount of means in my pocket, and was willing to expend it for that purpose, although I ought not to have been willing to expend a cent. I was kept in the reception-room, and when I made a suggestion that I would like to go into the operating-room or laboratory and see what was going on there I was met with the statement that it would require from five hundred to a thousand dollars to gain the desired admittance. I was treated in the most illiberal manner, and, poor as I was, I left the house with a degree of righteous indignation that I think was worthy of a saint; and when I got outside I looked up, and although I did not pronounce a curse upon that house, I did promise myself that I would see the day when those two dentists would sit at my feet and learn wisdom. Years afterward, when I had attained some reputation and was located in this city, I was gratified to receive a letter from these gentlemen soliciting the privilege of coming to my office and seeing my method of operating with crystal gold and cohesive foil, which was new to them. I immediately responded, cordially inviting them to come. They did so, and I entertained them for the most of two days, to their great satisfaction, and when they were leaving they proposed to pay me for my time and instruction. I repelled this proposition almost with indignation, as being contrary to the true spirit of professional courtesy, and reminded them that it would be both illiberal and degrading to make a traffic of what should be free to us all. They departed, seemingly under a deep sense of obligation to me, and I could not resist the conviction that they were impressed with the difference in the treatment they had received and that which they had extended to me years before. When I first came to New York, about the year 1839, immediately after the snubbing I have related, I was hoping, fearing, trembling. However, I went to old Dr. Eleazer Parmly (bless his memory), who took me by the hand and did everything he could to aid me; and his cousin, Jehiel Parmly, invited me into his *sanctum sanctorum* and showed me everything, seeming never so happy as when he was freely imparting knowledge concerning his profession. Solyman Brown, with his characteristic liberality, also welcomed me, not only showing me through his operating-room and laboratory, but introduced me to other distinguished dentists of the city, who all treated me with the most genial courtesy. His worthy son is here to-night. Those men gave me encouragement, and everything was as free as air. On the one hand I had been snubbed and obstructed, treated with hostility and contempt, and on the other I was wel-

comed and all information was freely given. I went to Philadelphia, and there met Townsend, Gardette, Neall, Roper, and others. Then I went to Baltimore, and met Chapin A. Harris, whose name we all honor, and which will be honored through all time,—noble, generous nature that he was. He met me with the most genial cordiality, and did everything that he could for me, taking me away from my hotel and ensconsing me in his own agreeable home. Those men were the best of men, and their reception was a splendid contrast to my former treatment. It is by that noble and generous disposition to help one another that we have established ours as an eminently liberal and beneficent profession, and no one has done more in this direction than our worthy friend, Dr. Atkinson. He is the highest exponent, living or dead, of the principle of liberality that he has advocated to-night.

Dr. Atkinson. The measure of a man's morality is the standard by which to judge him, irrespective of his intellectual attainments. We should never claim that which we are conscious of not possessing, although credit be given us. It was not all divine grace that made me devote myself to telling everybody everything that was revealed to me in dentistry. When I first came into professional circles, and was desirous of making progress in attainments, I met with just such treatment as we have heard described to-night. That made me feel that I ought to devote my ability to helping those who were seeking help, and showing them anything I had. Truthfulness and fraternity redeem the world.

In reference to this indorsement that has been given to my personal effort, I must tell you something. On the second day of January, 1861, at a meeting of the dentists of Indiana, held at Indianapolis, in Dr. Wells's office, I offered to make a clinic; it was not a forethought or an afterthought of mine at all; it was a revelation in me. And that was the first public dental clinic that was ever given to my knowledge. You see now and here what the sowing of the seed has produced. This is the harvest gathered to-night; or rather this is only the first fruits, the first crop.

Dr. Younger. I want to acknowledge my appreciation of Dr. Parr's kindness in having made a splint to retain this tooth which was implanted at the clinic. I have not seen it, but it is in there, and it feels so very comfortable that I wish to thank him for his forethought in the matter.

Adjourned.

The society held a regular monthly meeting, Tuesday evening, November 1, 1887, in the rooms of The S. S. White Dental Manufacturing Co., Broadway and Thirty-second street.

The president, Dr. W. W. Walker, in the chair.

Dr. C. S. W. Baldwin, of the Clinic Committee, reported as follows:

Mr. President and Gentlemen: There were present at the clinic this afternoon about one hundred and fifteen dentists. . . . Dr. T. D. Shumway, of Plymouth, Mass., demonstrated his method of operating with ivory points, filling a lateral on its approximal surface. He started the filling with the S. S. White "Velvet" cylinders, and used to complete the contour No. 3 "1000-fine" gold foil in single thicknesses. . . . Dr. Augustus J. Colby, of New York, showed a piece of bridge-work thirty years old, which he had taken from the mouth of a lady. The bridge was formed by soldering twelve continuous-gum teeth to a silver bar. The bar and the necks of the porcelain teeth were covered with a very hard gutta-percha, molded to fit the alveolar ridge, and caps of the same material fitted over the second molars. The teeth which supported the bridge, having become defective, were removed, and a suction-plate substituted. As good gutta-percha was not so common then as now, the doctor stripped most of it from the bar and used it for fillings. . . . Dr. W. D. Tenison, of New York, presented a patient having a twin lateral, and whose mouth was badly shaped as the result of the extraction of the sixth-year molars. Suggestions were made as to the best methods of regulating and treatment. The Clinic Committee would suggest that in all these unusual cases it is desirable that models or the patients be presented to show the results obtained from the treatment pursued, as in many instances more may be learned in this way than from seeing the case but once. . . . Dr. Edward Dobbs, of Brooklyn, brought a patient whose teeth were much affected by pyorrhea. The doctor had treated the case by packing threads saturated with aromatic sulphuric acid in the diseased sockets, which seemed to have done effective service. It was advised, in addition to this treatment, that the approximal surfaces of the teeth be filed so as to allow of their coming closer together, and supporting each other like staves in a barrel. . . . Dr. S. C. G. Watkins, of Mont Clair, N. J., exhibited a cast showing abrasion of the four inferior incisors at the gum-margin. There was much discussion as to whether the cause of the abrasion was mechanical, or purely chemical, or both. (The cast was passed around for inspection). . . . Dr. C. C. Carroll, of New York, showed specimens of cast aluminum plates, and promised that at a future clinic he would melt and solder this metal, which he has refined specially for his work. . . . Dr. Rynear presented a patient whose teeth he had regulated, using a rubber plate held in by gold bands, which surrounded the second bicuspids, the first bicuspid being extracted. To the outside of these bands rubber tubing was

fastened, and brought together over the teeth in front. The arch was thereby contracted, and a desirable occlusion obtained.

Dr. W. H. Atkinson supplemented the Clinic Report with the following remarks:

Dr. Atkinson. Notice was given that I would exhibit at the clinic a case of pyorrhea alveolaris under treatment. I have a very good reason for not presenting that case,—the patient was buried last Friday. But the case will be somewhat instructive to those who care to look into this matter at all; and I wish there could be a better apprehension on the part of the profession respecting this disease. It has been said in the journals that it was an indication of a tendency to desquamative nephritis or Bright's disease, and in the vast majority of cases I think they are concomitant. Whether they are causal, one to the other, remains to be proved. This case was under treatment for a considerable length of time, and when the patient was properly fed she did very well, but when she was neglected, as she had been for several months previous to the commencement of my treatment, there was a decided retrogression. The right inferior cuspid had descended the whole length of its crown, so that the point of the crown was on a level with the necks of the lateral and the bicuspid; and it was a puzzle in my mind whether the end of the root was dissolved away or not. I attached rubber rings, cut from tubing, and drew it up in two days to a level with the other teeth. I secured it there, and in less than two weeks it became firm; and the external portion of the inferior plate of the alveolus assumed a normal fullness, with a considerable degree of hardness. It was one of the most remarkable cases of reproduction and return to a healthy state without a pocket being used that I have ever seen. I wished to present to you the very case itself, but here, as in many other cases, man proposes and destiny disposes.

There is a great deal in the report which might be elaborated profitably; especially in respect to the advice that was given to trim the approximal faces of the teeth. That would be a good thing for dentists to think over wherever teeth have been thrown out of their normal position and occlusion, to see that they are not meeting like staves of an equal width their whole length, but that they have at the point of contact where they rest together little facets such as are ordinarily formed on teeth by the act of chewing.

Where teeth are sacrificed by this demoniac practice of extracting the sixth-year molars, if one is taken out on either side, above or below, all four should come out, in order to secure a good shape of the mouth; or put in an artificial tooth where one has been taken out, so as to hold the occlusion in check.

Dr. Frank Abbott. Mr. President: Dr. Atkinson's remarks in reference to pyorrhea alveolaris being usually found in conjunction with desquamative nephritis, or Bright's disease, brings to my mind a case of a gentleman who was suffering for several years with diabetes. I think his was one of the worst cases of pyorrhea alveolaris I have ever seen. With all I could do in every way, in applying remedies and removing the hard deposits from the teeth, it was impossible to stop the wasting away of the alveolar process and gum from the teeth. Whether there was any connection in this case, or in any case, between pyorrhea alveolaris and diabetes, or between pyorrhea alveolaris and Bright's disease, has not yet been definitely settled, but the history of many cases points in that direction.

Another case of pyorrhea alveolaris was sent to me some time ago, with a letter from a dentist asking me to examine a tumor in the lady's mouth. He stated that he had removed a tumor about the size of a large pea from the same locality, and that two or three weeks afterwards she came back and said it was growing again. After examining slightly himself, he thought he would like the opinion of some one else, so he sent her to me with the request that I would examine it and write him my diagnosis of the case. I found it was simply a case of tartar deposited around the necks of the teeth, in consequence of which the gum was constantly irritated, and a small tumor—myxoma or granuloma—was growing; not only in the place from which he had previously removed the growth, but inside, between the two teeth, and between two other teeth also. My conclusion was that the tartar had caused the trouble, and I advised its *thorough* removal and the proper cleansing of the teeth.

I speak of this more particularly because it seems to me that many of our young dentists are not careful enough in removing deposits from the teeth; they are likely to leave a portion under the gum, which excites an inflammation which ultimately destroys the sockets of the teeth as well as the gum; besides perhaps endangering the patient's life from growths like this, which at first are benign and appear of very little consequence, but which may assume a malignant type at no distant day, and directly cause the death of the patient.

President Walker. Gentlemen, I have the pleasure of introducing Dr. T. D. Shumway, of Plymouth, Mass., whose subject is

Dental Laws.

Dr. Shumway. The subject which I had selected, and on which I had partly prepared a paper, was that of "Dental Laws." That title

was suggested to me by reason of a matter of dental legislation which came up last winter in the Massachusetts Legislature, and which was up once before some two or three years ago; and at that time I felt it incumbent upon me to do what I could to prevent the enactment of a law to regulate the practice of dentistry in the State of Massachusetts. Last year, while my mind remained the same, in view of the fact that the dental profession in the State of Massachusetts seemed almost unanimously to favor the enactment of a law to regulate the practice of dentistry, I questioned whether I ought to do anything to prevent it, or set up my opinion against the opinions of such a large majority, and I therefore withheld any objections that I might have made; but I may say that I hold the same opinions still.

When I came to look over the subject upon which I proposed to write, I found it covered a much broader field than that of simply regulating the practice of dentistry by law. Dental laws are not only those which are found upon the statute book; but there are laws which are unwritten. Dentistry is unlike all other professions. It cannot be placed upon the same basis or upon the same footing with what are termed the liberal or the learned professions. It had its beginning entirely different from that of either medicine, law, or the ministry. The professions of the ministry, of law, and of medicine are as old as man himself. The very first man who reached consciousness felt the necessity of religion, and that called for the priest. It grew out of man's ignorance of the future. If man knew whither he was going, if he were sure of the unknown, he would not call in the services of the priest. It is because he does not know that religion developed, and the priest become a necessity. When once we do know what lies in the future, of course there will be no necessity for the ministry. In the discussion which took place recently at Springfield, before the American Board of Missionaries, among the objections urged against the new Andover School doctrine of probation after death for the heathen was one that, if that doctrine were accepted as true, the occupation of the minister would be gone. And that is a fact. Just as soon as you admit that the thing is settled beyond peradventure, people will not pay very much for the ministry. And it is so in regard to civil laws. The lawyer is as old as man, because human nature, ever the same, is made up of selfishness and greed, and we have to pay the lawyer to settle our disputes. And so with medicine. As soon as Adam partook of the apple he began to have the stomach-ache, and from that time all the way down through the history of the race there have been added to our materia medica specific remedies for the ills to which flesh is heir. But this is not true of dentistry.

There was no need of the dentist in the beginning; in fact, the dentist did not appear at any place in the world until a hundred years ago, or a little more. It is true that there is some evidence of a little knowledge of dentistry in olden times, and some claim for it a great antiquity, but I am inclined to think that a great deal of that evidence is mythical and the claim unsubstantial. Dentistry is little more than a hundred years of age. It had its beginning, its rise, its progress, and its highest development in America. I have thought a good deal about the reasons why it has made such rapid progress in America, while it has been slow and backward in every other country of the world. Five years ago I saw the statement, and I think it is pretty nearly true, that in Germany, with a population of about thirty-five millions, there were less than a thousand dentists; while in this country, with a population of about sixty millions, we have between twenty and twenty-five thousand dentists. Now, there is a reason for that. What is that reason? It is because of the superior intelligence and cultivation and the greater advancement of the American people. Dentistry relies here not upon the ignorance of the people, but upon their superior intelligence and cultivation, for its support; and in that it differs entirely from what are called the learned professions. They rely upon the ignorance of the people; we rely upon their superior intelligence. No more dignified or noble calling ever engaged the attention of men than that of dentistry. There is, to my mind, no calling that requires the exercise of all the faculties to the extent that dentistry does in order to be a faithful, honest, skillful operator. And the more intelligent and the more cultivated the people become the higher will be the appreciation of the dentist, and the greater will be the field of the dental profession. That is one of the reasons, and one of the principal reasons, why I objected to the practice of dentistry being regulated by statute law. Just as soon as you attempt to regulate it by law, just so soon and to that extent you cease to grow. The reason why the dental profession has grown from its small beginning to its present great proportions, is the freedom and liberality which have characterized its members. By attempting to regulate you will place a restriction upon that growth, and the tendency will be to dwarf the faculties and to produce precisely the opposite result from that which we are seeking to attain. That is one of the principal reasons why I was opposed to any law to regulate the practice of dentistry. There is another reason, and that is that I am a citizen of a free republic; I am a sovereign; I am not a subject, and I stand the equal of every man in the republic. I am a possible candidate for the Presidency, and I should not want to march up to the White House with a license to practice dentistry

in my pocket. It is not dignified; it is not putting me upon the basis which I as a citizen of the republic and a sovereign should occupy. Such legislation is only fitted for countries where the genius of the government is of an entirely different character,—where the basis is that of sovereign and subject. Here we are all sovereigns, and there are no subjects. I recognize the rapid growth and the great interest of the First District Dental Society of New York, and I am inclined to think that that growth and that interest have been the results not of dental legislation, but the results in spite of legislation of the indefatigable efforts of those who have the interests of dentistry at heart.

There is another unwritten law to which I am somewhat a subject; and I want to speak in this connection of the honor and kindness for which I am indebted to this society in being invited here to give a clinic and to appear before you. The unwritten law to which I refer is something that has come down to us from the past; we have received it from what has been termed the liberal professions; but I think that we made a mistake in accepting it, and that we should change somewhat our methods of dealing with those who are of a speculative or inventive turn of mind. Now, I appear here to-night as a patentee. The medical profession a long time ago—I think it originated in England—made it a misdemeanor or an offence for a physician to take any advantage whatever of the results of his own investigation in the way of improved methods or devices, holding that they should be free to all and for the benefit of all who were engaged in the same profession. Now, that was very well where the fee system was in vogue; but here in America we have an entirely different system from that which prevailed in the older countries when this unwritten law was adopted. I am inclined to think that we should encourage and foster, so far as we can, all efforts which are being made to simplify and improve the character of our operations, and make them easier for the operator and better for the patient. I do not mean by that that anyone should take such an advantage of another's ingenuity as was done in the vulcanite business, where the originator and inventor received no benefit or reward whatever, and where a body of men who had no part in the invention enriched themselves at the expense of the dentists and the public. But wherever we see a disposition on the part of a dentist to make changes, improvements, or anything that will tend to simplify and better the practice of dentistry, we should give him encouragement. I do not mean to say that we should not criticise them. I think the disposition which dentists have to closely examine and sharply criticise every new thing that is presented to them is wise and proper; but when after such critical

examination the thing survives, and is proved to be of value, I think the party to whom the invention belongs should be entitled to whatever pecuniary reward may attach to it. I mean to say that we of the dental profession should not be governed in our action by any laws, written or unwritten, which may be applied to another profession, because the position we occupy is entirely different. We should take a broad and liberal but at the same time a conservative ground, in order that we may encourage and foster all the inventive genius which our profession may exhibit, and that we and our patients may receive the full value of such efforts. I say this not because I ask for anything from the dental profession myself, but simply because I have been made to feel at times that there was a disposition on the part of dentists to look upon anything like an effort on the part of an inventor to profit by his thought and labor as a money-making scheme. Not in that sense do I mean to be understood, but that we should offer all the inducements and encouragement we can to the inventive genius of our profession, in order to stimulate its efforts; for that course will result in more inventions and improved methods, by which we shall all be benefited.

President Walker. Gentlemen, the remarks of Dr. Shumway are open for your discussion.

Discussion.

Dr. Shumway. Dr. Abbott tells me there are twelve thousand dentists in this country; therefore I wish to correct the figures I gave.

Dr. J. G. Morey. I saw it published in the *Sun*, as taken from the census of 1880, that there were fifteen thousand dentists in the United States.

Dr. Atkinson. Mr. President and Brethren: We are in deep water here, because we are dealing with questions that have been supposed to have been settled in the past, and we have learned to our discomfiture that they were only settled by accommodation of agreement. Wherever a code of ethics is adopted—and that means legislation—all who have not honor in them will disobey and infract the code whenever it may seem to be to their little personal advantage to do so. Who are the men that write down the ethics of the world? The make-believes, the men who assume a knowledge they have not. What do these codes of ethics and enactments of law signify? They signify this,—that inferior men get the advantage and claim to be endowed with wisdom, to say how the law does and should operate. They cannot turn everybody out and begin anew, and so they say that all persons who have been engaged in practice

for a certain specified time must not be disturbed, the constitution forbidding an *ex post facto* law. Our friend Shumway is right in his inspiration; but with regard to saying that we really know what we ought to do, he has not quite found that out.

On motion of Dr. Hodson, a vote of thanks to Dr. Shumway for his well-considered remarks, and for his services at the clinic, was passed.

Dr. Shumway. One word more, Mr. President, upon a point that seems to me most important. I think the success of our profession depends upon the intelligence of our patients. I would rather have one intelligent patient than a dozen ignorant ones. The worst people to work for are those who do not know anything about dentistry; and we should be very careful not to do anything to lull our patients to sleep with the idea that the law has thrown its protecting arms around the dental profession in such a manner that nobody can get into the practice of dentistry except those who are qualified, and that therefore they need not look out for themselves to see that their dentist is up with the times. That is one of the dangers that we are in now. The number of people in foreign countries who employ a dentist is comparatively small; they are mostly of the nobility and the gentry, while here everybody is a sovereign and everybody feels the necessity of dentistry. And that demand for the dentist is growing more and more every year, and it grows more and more important that we should keep abreast of the times; and if we are alive to this fact and act in view of it, we will build up a status of dentistry that some day in the future will put all the other professions to shame. We need not be afraid of medicine, law, or the ministry. We have a profession of our own, and the opportunities for education in it are far superior to those which I enjoyed when I began its study. The other day I happened to come across the certificate of my qualification to practice dentistry. I studied dentistry in a little town in Connecticut, with a real nice dentist who never was inside of a college, and I never had been then. I studied a couple of years with him, off and on, and when I got through he took a lead pencil and wrote on a piece of paper that I was a young man of good moral character and well qualified to practice dentistry. That was in 1860. I did not know there was a dental college in the world then. Since then they have sprung up all about us, and the means which the young men of to-day have for perfecting themselves —not perfecting themselves, but educating themselves, so that in future years they may perfect themselves—are so many and so great that there is no excuse whatever for a young man entering our profession without being well qualified to practice it. I believe in the highest possible education for the dentist, but I do not believe

in restricting dentistry. Any who may have a liking for it or desire to enter it I will welcome, for it is possible that there is in them the germ of something that will make them better dentists than any instruction they can get in the schools. Let us do all we can to encourage the schools and make them more efficient, but let us at the same time be very careful that we do not turn the cold shoulder upon any man who may be struggling to get into our profession, because he may have in him something that will be of great benefit to the profession and to those who are obliged to employ its members.

Dr. E. Parmly Brown. Mr. President and Gentlemen: Our friend from Massachusetts Bay has gotten off some very good ideas here to-night, but when he talks against dental laws he is talking right against common sense, good judgment, and the progress of the age. Dental laws are being adopted in one State after another just as fast as their people grow in good sense and judgment, and they can be presented and passed. You know how it is in this State. Men will stick out a sign as dentists when they have not even cracked a tooth open to see whether there was anything inside of it or not.

Now, we want not only dental laws, but we want good ones; and we want more laws, and we are going to have them. I intend to bring one before the State Society next year. That little student's contract that I presented to that society two years ago is one of the best things you have had; and when I introduced it one of the best men in the society got up and moved to lay it on the table. It was not laid on the table, but was accepted, and to-day any of you gentlemen in the State of New York who wish to take a student, and don't want that student to come next door in a few months and take away your patients, can send to the secretary of the State Society and get two blank contracts, iron-clad, and when they are signed you will have no trouble with your student. How are you going to have things comfortable unless you lay your plans? We have two more nice little dental laws that we are going to spring on you in this State. Next May I am going before the State Society with a paper that I am preparing, and I shall propose that we have a black list, as the medical men do. Within a radius of thirty miles of New York we will have a list of delinquents, and we shall know whom not to trust. Money is necessary. It will buy microscopes and feed you while you study, and it will pay railway fares to associations and clinics, and it is needful to pay hotel bills, and if you have not got it you can't buy books and instruments, and so you must look at the money side of things. We want a law passed for our protection, and we will get it; a law that will enable us to punish a man who gets our work under false pretenses, and de-

clines to pay for it. We want a law like the hotel-keepers and other business men have. There is a necessity for this law. A man will pay five hundred dollars for a fresco without protest, but when the dentist asks for pay for his work he thinks the dentist ought to pay him for the pain he caused him. We want to cure people of that notion, as well as cure them of their toothache, and we can cure them better of that when we have cured them of the habit of getting our work for nothing.

The President explained the non-attendance at the clinic of Dr. G. L. Curtiss, and stated that he would be present at a future meeting and give the results of his experiments—now incomplete—in implanting teeth in the jaws of lower animals.

Adjourned.

B. C. Nash, D.D.S., *Secretary.*

ANNIVERSARY MEETING OF THE FIRST DISTRICT SOCIETY.

The nineteenth anniversary meeting of the First District Dental Society of the State of New York will be held at the Masonic Temple, Twenty-third street and Sixth avenue, New York City, on January 16, 17, and 18, 1888.

PROGRAMME.

Monday Evening, January 16, 1888.

Prayer, Brady E. Backus, D.D., New York.

Address of Welcome, Dr. Wm. Wallace Walker, New York.

Response, Dr. Louis Jack, Philadelphia, Pa.

Papers.

J. Kimberley Beach, Esq., New Haven, Conn. Subject: "Past and Future Litigation Affecting Dentistry."

L. D. Shepard, D.M.D., Boston, Mass. Subject: "Prominence of Discussion upon one Tooth to be Deprecated."

Tuesday Afternoon, January 17, 2.30 *o'clock.*

Paper.

G. V. Black, M.D., D.D.S., Jacksonville, Ill. Subject: "An Examination of the Disturbing Forces in Physics, with Relation to the Germ Theory."

Discussion opened by W. Xavier Sudduth, M.D., D.D.S., Philadelphia, Pa.

Followed by W. C. Barrett, M.D., D.D.S., Buffalo, N. Y.; and C. T. Stockwell, D.D.S., Springfield, Mass.

Tuesday Evening, January 17.

Paper.

Frank Abbott, M.D., New York. Subject: "A Contribution to the Knowledge of Tumors of the Jaws."—Carl Heitzmann, M.D., Frank Abbott, M.D.

Discussion opened by R. R. Andrews, D.D.S., Cambridge, Mass.

Followed by C. Heitzmann, M.D., New York; W. Xavier Sudduth, M.D., D.D.S., Philadelphia, Pa.; Truman W. Brophy, M.D., D.D.S., Chicago, Ill.

Wednesday Afternoon, January 18, 2.30 *o'clock.*

PAPER.

J. N. Farrar, M.D., D.D.S., New York. Subject: "Philosophy of Correcting Irregularities of the Teeth."

Discussion opened by S. H. Guilford, A.M., D.D.S., Philadelphia, Pa.

Followed by E. S. Talbot, D.D.S., Chicago, Ill.; B. S. Byrnes, D.D.S., Memphis, Tenn.; V. H. Jackson, M.D., D.D.S., Norman W. Kingsley, D.D.S., New York.

Wednesday Evening, January 18.

PAPER.

W. H. Atkinson, M.D., D.D.S., New York. Subject: "Studies of Pyorrhea Alveolaris, with Illustrations from a Six-weeks' Kitten."

Discussion opened by A. W. Harlan, D.D.S., M.D., Chicago, Ill.

Followed by C. N. Peirce, D.D.S., Philadelphia, Pa.; Edwin T. Darby, D.D.S., Philadelphia, Pa.; James Truman, D.D.S., Philadelphia, Pa.; R. B. Adair, D.D.S., Gainesville, Ga.; M. L. Rhein, M.D., D.D.S., New York; A. R. Starr, M.D., D.D.S., New York; J. N. Farrar, M.D., D.D.S., New York.

CLINICS.

Clinics will be held at the New York College of Dentistry, Second avenue and Twenty-third street. Clinics commence at 9 A. M., and last till 12 o'clock sharp.

In order that our Clinics shall be conducted in the best manner possible, Dr. H. J. McKellops, of St. Louis, has kindly consented to act as Supervisor, in connection with our regular Clinic Committee.

Tuesday, January 17.

E. C. Kirk, D.D.S., Philadelphia, Pa. Implantation.

R. B. Adair, Gainesville, Ga. Filling Simple Proximal Cavities in Incisors, using non-cohesive gold foil.

J. Bond Littig, D.D.S., New York. Contouring Front Teeth with Porcelain.

G. H. Winkler, M.D., D.D.S., Augusta, Ga. Immediate Extirpation of the Nerve and Filling Nerve Canal.

W. C. Wardlaw, D.D.S., Augusta, Ga. Filling Approximal Cavities of Lower Teeth with a combination of Gold and Tin.

A. W. Harlan, M.D., D.D.S., Chicago, Ill. Treatment of Pyorrhea Alveolaris.

T. T. Moore, D.D.S., Columbia, S. C. Combination Non-cohesive and Cohesive Gold Filling.

Dr. C. Frank Bliven, Worcester, Mass. An Experiment in Pneumatics, demonstrating its practical success.

T. S. Waters, D.D.S., Baltimore, Md. Removable Bridge.

R. B. Adair, D.D.S., Gainesville, Ga. Treatment of Pyorrhea Alveolaris.

A. G. Bennett, D.D.S., Philadelphia, Pa. Crown and Bridge-work.

C. N. Peirce, D.D.S., Philadelphia, Pa. Filling with Soft Gold Foil under water.

W. G. A. Bonwill, D.D.S., Philadelphia, Pa. Demonstrating the use of the Bonwill Mechanical Mallet.

Frank Abbott, M.D., New York. Demonstrating the use of the Abbott Automatic Mallet.

H. C. Register, M.D., D.D.S., Philadelphia, Pa. Treatment of Pulpless Teeth, filling root and crown cavity at same sitting. Also, demonstrating the use of the Register's Mechanical Mallet.

J. F. P. Hodson, D.D.S., New York. Filling Teeth, using Watts's Crystal Gold.

R. I. Verplanck, D.D.S., Albany, will fill teeth, using the Verplanck Matrix and Matrix Pluggers.

Dr. E. S. Gaylord, New Haven, Conn., will demonstrate the use of his Ivory-pointed Pluggers. Also, a new Rubber-dam Holder.

A. H. Gilroy, D.D.S., Boston, Mass., will demonstrate his Pneumatic Mallet Hand-piece and Chip-blower Attachment.

C. Edmund Kells, D.D.S., New Orleans, La. Dental Electrics.

J. A. Swasey, D.D.S., Chicago, Ill. Dental Clamps.

For further particulars, apply to Dr. W. W. Walker, president, No. 67 West Ninth street, or to Dr. A. L. Northrop, chairman Executive Committee, No. 57 West Forty-ninth street, New York.

EDITORIAL.

THE UNION MEETING THIS YEAR.

The board of officers of the American Dental Association has by an almost unanimous vote ratified the action of the committee appointed to confer with a similar committee of the Southern Dental Association relative to the holding of a union meeting this year, changing the place of meeting from Old Point Comfort to Louisville, Ky., and the time from the first to the fourth Tuesday (28th) of August, 1888.

THE FIRST DISTRICT DENTAL SOCIETY.

The programme for the nineteenth anniversary meeting of the First District Dental Society of the State of New York will be found on another page. We are requested to say that any dentist who has not received a direct invitation is solicited to consider himself as personally addressed by this general notice, and is assured of a cordial welcome.

"THE OLDEST GRADUATE" AGAIN.

We have received the following communication from Dr. Thackston, who, as will be seen, gracefully accepts the situation and takes position as second oldest graduate. We hope that Drs. Mackall and Thackston may enjoy their relative positions for many years to come:

To the Editor of the Dental Cosmos:

Sir: Please accept my hearty thanks for lifting from me the uncoveted and often *embarrassing* distinction of being the "oldest" surviving graduate of the Baltimore College of Dental Surgery.

You will appreciate my gratification at the announcement that one *older* than myself has been discovered, when I inform you that I am a *widower*, and that

my prospects have not been improved or enhanced by the extra designation I have unwittingly for a time been compelled to wear. I rejoice to know (as I did not until I read the last number of the Cosmos) that Dr. Mackall still lives, and holds an honorable position among his fellow-citizens. I was under the impression that *both* the first two graduates had passed away. I think such was the conviction of the profession generally.

Drs. Mackall and Arthur were the first in the world—at least in historic times—to receive a dental diploma and degree; their graduation antedated my own *one year*. I am certainly happy to hear that we yet have Dr. Mackall with us, and most cordially congratulate him upon his years, his good health, and the civil honors he has won, and no doubt deservedly wears, and take great pleasure in resigning to him the position, dignity, and distinction of "oldest" living graduate of the Baltimore—the first dental college of the world.

In haste, your obedient servant, etc.,

W. W. H. Thackston.

Farmville, Virginia, December 12, 1887.

CORRECTION.

By one of those unaccountable errors which the best care seems impotent to guard against, a type in the name of the author of the leading paper in the last issue of the Dental Cosmos was transposed, on the press, causing an irritating mis-reading of the line. It is scarcely necessary to express our regret of the mishap, which occurred under circumstances which compelled the issue of the number without correction; nor is it more needful, to those who know the gifted author of the paper, to state that his name and address should have been printed, "Dr. C. T. Stockwell, Springfield, Mass."

POSTAGE RATES TO AUSTRALIA AND NEW ZEALAND.

By a change in the rulings of the Post-office Department, the postage on the Dental Cosmos to Australia and New Zealand is now rated at 25 cents a year, instead of 96 cents as heretofore.

BIBLIOGRAPHICAL.

Anatomy, Descriptive and Surgical. By Henry Gray, F.R.S. Drawings by H. V. Carter, M.D. Edited by T. Pickering Pick. New American from the Eleventh English Edition. Revised and re-edited, with additions, by William W. Keen, M.D., professor of surgery in the Woman's Medical College of Pennsylvania, etc. Royal 8vo, pp. 1100. Price, cloth, $600; full leather, $700; with colored illustrations, $8.25. Philadelphia: Lea Brothers & Co., 1887.

The successive editions of "Gray" have been eagerly sought and highly prized by students and practitioners, on both sides of the

Atlantic, for more than twenty years. Although the general character of the work has been preserved, many and notable alterations have been made which greatly enhance its value. The English editor, a thorough anatomist and teacher, has made careful revision, and has entirely rewritten the sections on Development and General Anatomy, in order to keep pace with the results of research in these branches. Several other departments give evidence of his careful and conscientious labors.

The American edition has been subjected to an intelligent and careful revision by Dr. Keen, with many, varied, and valuable additions. He has also furnished one hundred and thirteen engravings, many of them original. Holden's well-known "Landmarks," with new matter and revision by Dr. Keen, has been appended to the volume.

The value of the work has been greatly enhanced by the coloring of the arteries, veins, and nerves, adding decidedly to the beauty of the illustrations.

We could wish that the illustrations of the teeth singly and in situ had been laid aside in favor of newer and more correct representations. Indeed, we consider that in this department there has been less careful revision than in any other portion of the volume.

The publishers have issued the book in handsome style, and, indispensable as the previous editions of "Gray" have been, this must needs be classed among the books which the student and practitioner of medicine and of dentistry cannot do without.

600 Medical Don'ts: or, the Physician's Utility Enhanced. By Ferd. C. Valentine, M.D., ex-surgeon-general army of Honduras, member of the Medical Society of the County of New York, etc. 12 mo, 125 pp. and index. New York: G. W. Dillingham, 1887.

This little volume, intended for popular reading, is made up of brief and pithy sentences, embodying injunctions in the form of "Don'ts," with reference to the preservation of health and the treatment of disease. The purpose of the book seems to be to establish a proper relationship between physicians and patients, and in a somewhat novel style a large number of truths are forcibly presented. The "Don'ts" embrace Hygiene, Emergencies, Maternity, Infancy, Childhood, the Sick Room, etc., subdivided so that easy reference may be made to the subject presented,—as, for instance, under Hygiene, sections are devoted to mental work, exercise, drainage, bathing, sleep, etc.

We have no hesitation in saying that most of the advice is judicious, and attention to these "Don'ts" would save much suffering to a large class of the community.

OBITUARY.

LATHAM L. BUCKLAND, D.D.S.

Died, in Providence, R. I., August 3, 1887, of bronchial phthisis, Latham L. Buckland, D.D.S., in the fifty-first year of his age.

Dr. Buckland was a native of East Windsor, Conn. He graduated from Union College, Schenectady, as a civil engineer, in which profession he did honorable service during the war of the Rebellion, as attested by his gradual promotion to the rank of captain in the First New York Corps of Engineers. After the war he devoted himself for several years to railroad engineering, running the lines and superintending the construction of several well-known routes in the States of Maine and Oregon, through tracts of country of more than ordinary difficulty, requiring the greatest skill, energy, and experience.

Later Dr. Buckland commenced the study of dentistry with his brother, A. W. Buckland, D.D.S., of Woonsocket, R. I., and graduated from the Philadelphia Dental College in the class of 1879. His course as a member of the dental profession was marked by the strength and sturdy energy he exhibited as a civil engineer. He soon won the friendship of the best members of the profession in the State, and was chiefly instrumental in organizing and keeping usefully alive the Rhode Island Dental Society, whose secretary he was for nine consecutive years, and at his decease holding the office of president.

Of a genial, social disposition, strong in heart as in his own physique, the dental fraternity loses in him a brother and supporter, and his wife and children a kind husband and father.

W. P. Church, *Sec. R. I. Dental Society.*

HAMILTON FORREST, D.D.S.

Died, in Chambersburg, Pa., November 6, 1887, of pulmonary consumption, Hamilton Forrest, D.D.S., in the forty-eighth year of his age.

Dr. Forrest was born in Carroll county, Maryland, where he spent his boyhood and early manhood. He studied dentistry with Dr. Foulke, of Westminster, Md., and graduated from the Pennsylvania College of Dental Surgery, in March, 1866. Immediately thereafter he began practice in Littlestown, Md., but in August of the same year removed to Chambersburg, where he spent the remainder of his days.

Dr. Forrest was a painstaking, conscientious, and capable operator, and enjoyed the confidence and patronage of a goodly number

of patients. He was not favored with robust health, and about a year before his death physical weakness compelled him to give up practice altogether. His end was peaceful. G. F. P.

DR. DAVID M. PARKER.

At the annual meeting of the American Academy of Dental Science, held in Boston, Mass., November 16, 1887, a committee, consisting of Drs. Elisha G. Tucker, Jacob L. Williams, and Edward N. Harris, reported resolutions, which were unanimously adopted, concerning the death of Dr. David M. Parker.

The resolutions expressed sorrow at the death of a friend and associate, Dr. Parker being an honorary member and former president of the society; recited that the Academy had lost one of its most worthy members, a "man of excellent judgment and skill in his profession, interested in all movements looking towards its better organization and education and the advancement of its practice; one who was highly esteemed in the community in which he lived, because of his kindly virtues, and his earnest, upright, and sincere life." Deep sympathy was expressed with the widow in her bereavement, and the resolutions ordered engrossed upon their records, sent to the family, and printed in the journals.

PUBLISHER'S NOTICE.

THE NEW VOLUME.

The development of technical journalism is coincident with progress in every branch of art and science. And as science has never had more earnest devotees than at the present time, so special journalism has never before been so useful and indispensable as now. The periodical literature of dentistry is increasing in importance as the practical applications of discovery and invention are constantly opening up new resources and new methods to the student of that specialty.

The Dental Cosmos is a recognized force in dentistry, and the fruits of its seed-sowing are to be found in every quarter of the civilized world. It assumes to deal only with matters which concern dentists as such, and they profit by this restriction and concentration of its sphere and function. Its measure of usefulness can be judged by the means through which it seeks to meet the wants of its thousands of subscribers,—keeping them informed of the latest thought and work in the line of their profession and occupation.

☞ **See Blank for Subscription opposite this page.**

THE S. S. WHITE DENTAL MFG. CO.

THE

DENTAL COSMOS.

VOL. XXX. PHILADELPHIA, FEBRUARY, 1888. No. 2.

ORIGINAL COMMUNICATIONS.

UNUSUAL BRIDGE-WORK.

BY R. WALTER STARR, D.D.S., PHILADELPHIA, PA.

A GENTLEMAN past eighty years of age presented himself for an examination of his teeth and mouth, which were found in so deplorable a condition that the prospect for restoration and substitution by ordinary prosthetic methods seemed well-nigh impracticable. For the upper jaw, nothing other than immediate relief by the use of the forceps would have been considered advisable if the patient had not, with persuasive insistence, pleaded for a persevering attempt to do *something* before resorting to extraction.

A piece of bridge-work had been some months previously mounted upon the excised superior right lateral, left central, and right and left cuspids. The bridge had been imperfectly constructed, and the posts set in amalgam. It was still,—no not *still* in the mouth, for it moved with every movement of the lips, and did not drop out solely because of the divergent posts in the roots. Both of the cuspid roots were split, and the other roots were so loosened that it seemed as though they would come out if the bridge were to be removed. This was, however, done without much difficulty, and the mass of underlying filth washed away.

The bog in which the roots were stuck yielded in all directions, and a slight pressure caused pus to flow from sinuses opening half an inch or more above the necks of all the roots on both their palatal and labial aspects. Preliminary treatment was begun by syringing the roots and sinuses with diluted aromatic sulphuric acid, followed in half an hour by the like exhibtion of a weak solution of carbolic acid and Listerine. The subsequent daily treatment was substantially similar, varied by the occasional employment of tincture of iodine on the surface and in the roots.

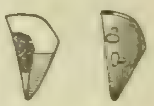
When some restorative progress had been made, the appearance was as represented in Fig. 1. The lines of fracture in the split cuspids

are shown in the cut. The left cuspid had been nearly equally divided throughout its length. The parts were first bound tightly together by wrappings of fine wire; holes were drilled obliquely in the root-end from one part into the other at the points indicated; the holes were tapped with anchor tap No. 5, a piece of anchor screw wire turned into the bottom of each hole, and then cut off flush with the root-end. The wire ferrule was replaced by a tight-fitting gold collar, and the further treatment and preparation of the root completed.

It will be seen that the right cuspid had been split into three pieces. The mesial portion was obliquely split off, and had been so long bathed in pus as to have become almost a sequestrum; it was therefore removed. Its cemental surface was then pressed into moldine, a fusible metal die made, and a corresponding piece of thin pure gold struck up. To the concave surface of this plate two headed platinum pins (taken from broken porcelain teeth) were soldered, and the piece appeared as shown in Fig. 2, which also shows the root fragment.

FIG. 1.

FIG. 2.



The interior of the root was then suitably under-cut with engine-burs, the gold plate put in the place of the extracted root-piece, and bound firmly in position relative to the remaining root fragments by fine binding-wire, as in the case of the other split cuspid. Dry amalgam was then packed into the root and around the plate-pins. At the next sitting the wire ferrule was removed, and a gold collar fitted tight around the splint and root, which was then drilled to receive a suitable crown-post.

Continued treatment resulted in the restoration of all the diseased parts to a condition of apparent health and assured comfort at the end of the sixth week from the time of his first visit, and this favorable outcome was in great measure due to the perseverance of the patient, whose intelligent appreciation of the effort being made in the face of discouraging difficulties was the stimulus that quickened the endeavors which might otherwise have flagged into failures.

The fitting of the lateral and central with caps and posts and the fitting of telescoping caps over the collars of the cuspids were

proceeded with in the usual way, and short saddles of gold plate were struck up to rest on the ridges of the gums behind the cuspids for the support of two plate bicuspids on each side. The completed bridge appeared as shown in Fig. 3.

The lower centrals, laterals, and cuspids had been worn down nearly to the gum; the bicuspids were all present, and the right second bicuspid in good condition, but the others were ground more than half away. (See Fig. 4.) The right second molar stood in

FIG. 3.

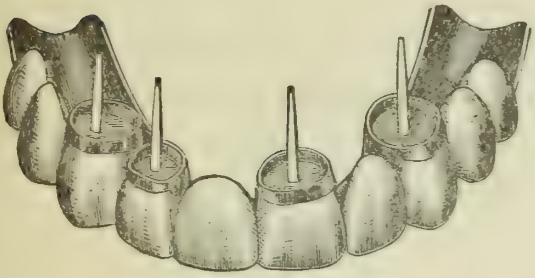
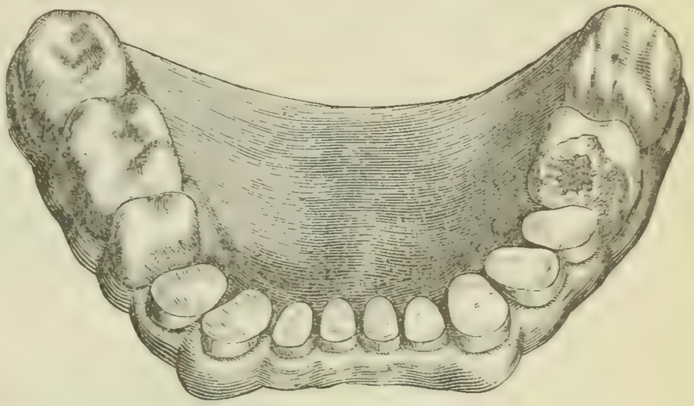


FIG. 4.

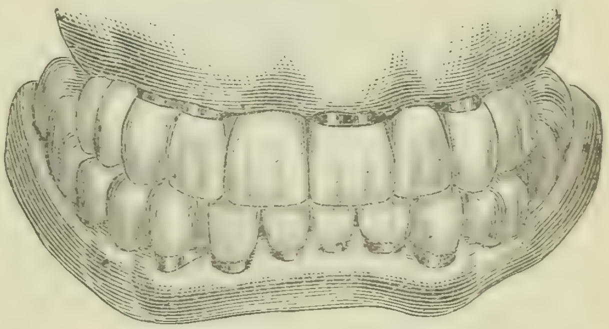


the place of the first molar, and was uplifted so as to expose the bifurcation of its roots. The right third molar lay upon its mesial side. Both these molars had been filled and preserved. The left second molar occupied the place of the first molar, and had but its distal wall remaining. The third molar had a large crown filling, and was well preserved.

The treatment of the bicuspid roots and the left second molar had been carried on simultaneously with that of the roots in the upper

FIG. 5.

FIG. 6.



jaw, and a like satisfactory restoration to health and comfort obtained.

The left lower molar was contoured with gold, and gold cap-crowns set on all the bicuspid roots. Gold caps were fitted on the worn crowns of the lower cuspids, laterals, and centrals, and a porcelain-faced bridge constructed by uniting the backings and caps. Posts were employed only in the cuspids, because the other teeth were all alive, and the caps fitted so closely that the merest film of cement

sufficed to hold each cap in place, and made the bridge thus organized a very firm structure. The bridge, viewed from its under side, appeared as shown by Fig. 5. The completed denture is represented by Fig. 6.

The patient has been casually met several times since he was discharged, and on every occasion his report has been satisfactory, without any qualification. So lately as a few days ago, more than a year after the operation, he told me as we met in the street that he had been entirely free from discomfort, and had used the artificial teeth without any difficulty from the day of their completion until then. What else he said in expression of his sentiments on the subject of prosthetic dentistry, as viewed from the appreciative lay standpoint, although sound as it seemed to the individual immediately concerned, need not be made a part of this brief report of a case which, it is hoped, may prove an encouragement to some despairing dentist under similar trying circumstances.

A REGULATING DEVICE.

BY DR. A. E. MATTESON, CHICAGO, ILL.

In minor operations for the correction of dental irregularities, such as that illustrated in Fig. 1, I have found very useful the compound coil and lever spring shown in Fig. 2. This is made of piano-wire, No. 14 or 16, according to the degree of expansive power designed to be exerted by it. The diameters of the coils and the lengths of the levers are to be determined by the positions and relations of the teeth to be moved. So, too, the distance of the coils from each other will depend upon the circumstances of the case.

Preferably the coils are to be made small and the levers short, in order that the device may lie close to the teeth upon which it is intended to act. A narrow ribbon is then to be made of gold or platina plate, as thin as No. 40, and of a length sufficient for its special purpose.

In the case illustrated, the ribbon (see Fig. 1) bends over the distal side of the central, passes behind the lateral, and comes out over the mesial side of the cuspid. The free ends of the spring levers are brought towards each other, and, by means of fine binding-wire or strong twine passing through their loops, are held against the expanding strain of the compressed coils (see Fig. 3). The bound spring is then to be laid over the ribbon ends as they rest on the central and cuspid, and the ribbon marked where the ends of the spring touch it. The ribbon is removed and punched with a plate-punch at the marked points, and also at other points near these and towards the middle of the ribbon, to provide for the taking up

of the ribbon as its ends become separated by the distending action of the spring during the progress of the operation. The ribbon is again put in place on the teeth; the lever ends inserted in the punched holes, and the twine cut or the binding-wire untwisted to bring the spring into operation, as exemplified in the illustration, Fig. 1.

In a case similar to this, the lower incisors shut in front of the upper lateral, and came so near the gum that a ribbon could hardly be made so narrow as not to be driven into the gum by the lower

Fig. 1.

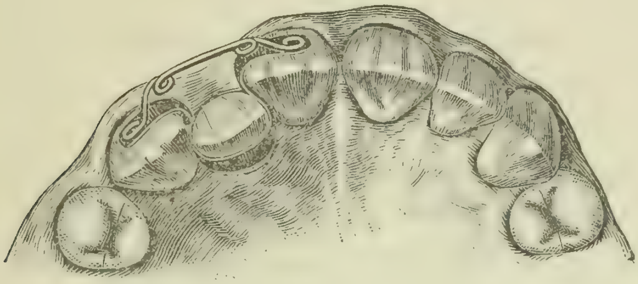
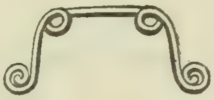


Fig. 2.



incisors. Therefore, a ligature of strong gilling-twine had one end tied in a slip-noose knot to the eye of one of the spring levers, and was then passed once around the lateral and through the eye of the other lever, so that, by drawing the lever ends hard towards each other and securing the ligature by a half-hitch knot, the device was brought into operation with the same effect as seen in Fig. 1. In this instance the ligature was but twice renewed, and the lateral brought into proper alignment (see Fig. 4) at the expiration of ten days, with but little pain or discomfort to the patient.

Fig. 3.

Fig. 4.

The gilling-twine takes precedence where the operator can see the patient every four or five days, for the purpose of renewing the twine.

It will be observed that the compound spring pushes apart the central and cuspid, at the same time drawing outward the lateral. In the case just mentioned there was a lateral displacement of all the neighboring teeth, to the amount of an eighth of an inch, and a simultaneous outward movement of the lateral to the extent of its own diameter.

By the use of a longer compound spring, several teeth may be brought into line at the same time. For example, when the lower incisors are in a "jumbled" condition, the ribbon or ligature may be woven in and out over and around the proper teeth, in a way that will bring the moving power of the spring into such action that some teeth will be pushed apart to make room for others which are being pulled into place during every moment that the action of the device is continued.

In adapting a long spring to a case of this kind, the coupling-wire may be bent to conform it to the curve of the dental arch and make the spring lie close upon the teeth. If, however, for any reason the spring should irritate the lip or gum, a strip of rubber or gutta-percha base-plate may be folded over the spring so as to cover it and present a smooth surface on both its sides.

The persistent yet controllable complex action of this compound spring, in cases of the kind illustrated and described, has proven so satisfactory to its inventor that it is with some degree of confidence submitted to the judgment of the profession as well adapted to the purposes for which it has been designed.

PROCEEDINGS OF DENTAL SOCIETIES.

NINTH INTERNATIONAL MEDICAL CONGRESS.—SECTION XVIII. DENTAL AND ORAL SURGERY.

(Continued from page 17.)

FIFTH DAY—*Afternoon Session.*

A PAPER by Dr. E. Andrieu, of Paris, France, was read by Dr. L. D. Shepard, of Boston.

The first permanent molar, says Goodsir, is man's most remarkable tooth, in that it forms the connection between the deciduous and permanent sets. Reviewing the facts and theories advanced by the authorities (Tomes, Legros and Magitot, and others, who have made a special study of the formation and genesis of this tooth), the writer reached the conclusion that the tooth commonly called the first permanent molar could not properly be classed among the permanent teeth. Its physiological office is to limit the portion of the maxilla occupied by the deciduous teeth during the period of displacement, to keep the articulation at the desired height during this displacement, and to serve the purposes of mastication at the same time. Its period of greatest usefulness is from the time of its eruption until its neighboring teeth are in place; then it is less useful, and in particular cases its presence may be injurious; and sometimes, its office

being done, extraction is the proper course to pursue with regard to it. Examinations of the teeth of 1000 children from nine to twelve years of age, in the Charity Hospital for Children, during the years 1863–1870, showed that the sixth-year molars of 74 in 100 were decayed; of 600 children encountered in private practice, the same teeth of $74\frac{33}{100}$ in the 100 were found decayed; and of 400 persons, from fifty-five to sixty-five years old, the sixth-year molars of $75\frac{1}{2}$ in 100 were lost, and those that remained were decayed or filled. These figures give the indisputable fact that 74 or 75 per cent. of these teeth decay. After the sixth-year molars, the wisdom-teeth decay most generally; then, in order, the twelfth-year molars, the bicuspids, and the incisors, the cuspids being the least likely of all the teeth to decay. During twenty-five years' study of the subject, all the statistics which the writer had seen gave almost uniform results,—namely, that the sixth-year molar is more subject to disease than any other tooth in the mouth. There are four reasons for this predisposition: 1st, the lesser density of the tooth than that of the permanent teeth; 2d, the external configuration of the crown; 3d, the constant acidity of the oral secretions during the displacement of the deciduous teeth; and, 4th, the proximity of the distal surface of the second deciduous molar, which is almost always decayed.

The wisdom-tooth when hindered in its eruption, which in the writer's opinion is usually dependent on the presence of the sixth-year molar, is usually decayed. It follows that if the sixth-year molar were extracted, so as to give the wisdom-tooth room, the latter would rarely decay; and he ventured the opinion that the wisdom-tooth, though not erupting in the space occupied by the sixth-year molar, and separated from that space, is still the tooth intended to take its place. The sixth-year molars should not be extracted when of good structure in good jaws, the deciduous teeth in good condition, and there is plenty of room. When the temporary teeth have not sufficient room the molars decay rapidly, and if the sixth-year molar is also decayed it should be extracted. It seemed rational to extract the sixth-year molar in mouths of bad conformation, particularly if decay is present. If decayed on the anterior or posterior approximal surface, it will cause the contiguous surfaces of its adjoining teeth to decay.

In regulating the teeth, unless the work can be accomplished in three months without the extraction of the sixth-year molar, it should be removed, as when extraction is required it is the tooth that can best be spared. A critical moment is when the twelfth-year molar is ready to erupt, and three-fourths of the space for the second bicuspid is occupied by the first. Is it not reasonable to extract the sixth-year molar under such circumstances? The proper time for

its extraction is when the twelfth-year molar is about erupting. The bicuspids have then attained their full length, and they can fulfill both rôles of the sixth-year molar,—viz., sustain the articulation and accomplish mastication; but until that time it should be kept carefully. At the time the writer commenced the practice of dentistry it was the rule that all the teeth must be preserved. That was the period of abscesses. Then there was a return to the extraction of the sixth-year molar,—not promiscuously, but with judgment, based on rational principles.

Dr. Shepard, in opening the discussion, said that had not the paper he had just read been written by some one across the water it would not have gone on the record as an exemplification of modern practice. His own opposition to the extraction of the sixth-year molar was based largely on the fact that it was a better tooth than the majority of the others. It was the practice twenty-five to fifty years ago to extract this tooth in what might be called a promiscuous manner. He had seen hundreds of patients whose sixth-year molars had been sacrificed under this method of treatment, and having compared the condition of their teeth with the results of modern practice, he had formed the idea that with thirty-two teeth in the mouth respect should be paid to each tooth; that none should be condemned without the benefit of a trial. There is no more reason to select the sixth-year molar for sacrifice than any other tooth. Another fact should be recognized,—that extraction is mutilation, just as when it is deemed necessary or justifiable to amputate a limb it is nevertheless mutilation, and mutilation should be for cause determined, not because the member to be sacrificed is the right ear or the left eye or the sixth-year molar or the first bicuspid, but because the laws which underlie the relations of the parts to their uses should be studied, and the selection made according to those laws, among which should not be overlooked those of heredity. The question of expediency is dependent upon the arrangement and occlusion.

With regard to the basis of the argument of the paper, it is put on a narrow foundation. What if the sixth-year molar is a temporary tooth, or even a tooth of transition? If it is either of these, why has not nature provided for its self-extraction? The fact that its removal is not so provided for is an argument that it was not so intended. Dr. Andrieu in the tables which he gives refers to the frequency of decay in this tooth, and from the showing these make insists that it should be extracted. This seemed like basing an argument in regard to the health of a nation on the deaths from small-pox where victims were allowed to die without medication. The only tables which would be good for anything would be those which showed the ratio of preservation to adult life where faithful means

of preservation were persistently applied. Dr. Shepard's own conviction was that the sixth-year molar is just as good a tooth and just as valuable as the twelfth-year molar or the bicuspids, and under ordidary circumstances and with ordinary care is more apt to be found in its place in the jaw at fifty years of age than the bicuspids treated in the same manner; and more, that the sixth-year molar, if attended to at the proper time and in the proper manner, has a probability of duration in usefulness as great as any of the other teeth except the cuspids. Hence, he invariably insists on treating this tooth as soon as it requires it, the same as any others.

Dr. Paul Dubois, Paris, France, wished to express his own disapproval of the idea of the extraction of the sixth-year molars advanced by Dr. Andrieu, and to state that it is not generally believed in by the scientific dentists of France. The theory that extraction of this tooth should always be resorted to in case of caries is bad. It should not be sacrificed for such cause any more than any other tooth, except as a *dernier ressort.* There is no doubt that the extraction of the sixth-year molar almost invariably interferes with the articulation and occlusion of the remaining teeth, which do not keep the places nature designed for them, and it has also a bad influence upon the maxillary bones, interfering with the proper mastication of the food.

Dr. W. P. Horton, Cleveland, O., had never acceded to the idea of the wholesale extraction of the sixth-year molars. As an illustration of his practice, he presented the cases of his two sons. With the first he began filling the sixth-year molars as soon as they began to decay; that son has now thirty-two teeth. When the sixth-year molars of the second son showed signs of decay, he extracted three of them and left the fourth, the left inferior, into which he put a gold filling. That tooth is good to-day, and its owner has twenty-eight teeth. At the age of twenty, a very handsome wisdom-tooth was extracted because there was no room for it in the jaw. The conclusion whether to treat or extract these teeth should be based on sound principles, taking into account the age, sex, nourishment, and probability of a large jaw. The unfortunate thing is that so few patients seek the dentist until the teeth are too far gone to be worth saving.

Dr. Frank Abbott, New York. In reference to the question as to whether the sixth-year molar is intended as a permanent or temporary tooth, the paper makes two points. The first, the assertion that it is not so well calcified as the other permanent teeth, is gratuitous. The difference in this regard between the deciduous and permanent teeth is plain; there is no difference between the latter and the sixth-year molar. The second point made is that it is

formed from a bud which dips down from the process the same as in the evolution of the deciduous teeth. The difference is that the buds on the temporary follicle from which the permanent incisors, cuspids, and bicuspids arise dip down and come up under their predecessors; while the sixth-year molar has a bud for the second permanent molar, and this again for the third molar, which does not dip down.

A brief paper by Dr. Th. David, Paris, France, entitled "Aphthous Stomatitis and its Origin," was read by the secretary, Dr. Dudley. The writer was of the opinion that aphthous stomatitis is not a local lesion, but is rather of the nature of a general affection, of which he described the pathology. It is the same as the aphthous fever of animals. The special microbe concerned in its progress does not seem to be known. That the disease is contagious is proved by facts known. He thought it proper to draw the attention of government authorities to the subject, in order that measures may be taken to prevent the sale and consumption of milk given by animals suffering from aphthous fever.

Dr. Dudley also read a brief paper on "The Necessity of an International Inquiry into the State of the Dental System among Different Peoples," by Dr. Paul Dubois, Paris, France, which urged the desirability of the appointment of an international commission of three members, to be appointed by the Congress, charged with the duty of editing a question-book, to be translated into the principal modern languages; each of the commissioners to centralize the information, and to have authority to give complementary instructions to such persons as will take an interest in the matter and have a desire to answer the questions laid down.

Dr. John S. Marshall, of Chicago, read a paper which was entitled "Operation for the Cure of Persistent Neuralgia of both Temporo-Maxillary Articulations and Reflected Pain in the Right Brachial Plexus, of Eight Years' Standing, with Results, and Remarks on Bone-Grafting." The case was believed to be unique as to the causes which produced the trouble and the means used for its cure. The patient had been operated upon eight years before coming under the writer's care, for the removal of an osteo-sarcoma of the right inferior maxilla, involving exsection of the bone from the first bicuspid back to and including the angle and about half an inch of the ramus. Extensive suppuration followed, and when the wound healed, after several months, an ugly cicatrix about an inch in width at the base and four inches in length was left; the jaw was considerably displaced, the right ramus being brought forward, and the jaw carried backward and to the right, so that the median line of the chin was a half inch to the right of its proper position. Fibrous union

had taken place, but it afforded little support, the distance between the ends of the bone being about one-fourth of an inch. Motion of the jaws or any movement which jarred the body excited paroxysms of neuralgic pain in the temporo-maxillary articulations and in the right shoulder and arm. The mouth could be opened three-fourths of an inch. The teeth of the upper jaw had all been lost; those of the lower jaw were free from caries, but affected by pyorrhea alveolaris. All the usual remedies had been tried, but no relief was afforded. Careful examination brought the conclusion that the pains in the articulations resulted from contraction of the cicatrical tissue and the displacement of the jaw, and those in the brachial plexus were reflex, and due to the same cause. April 23, 1886, the fibrous connection was cut through (within the mouth), the jaw placed in normal position, and the wound packed with sterilized sponge, to hold the ends of the bone apart and relieve pressure on the articulations, and the edges were closed with sutures, bichloride of mercury solution ($\frac{1}{1000}$) being ordered as a mouth-wash. There was no recurrence of pain until the sponge was removed, May 7, on account of suppuration. The following day the pains in the articulations returned, though less severely. This confirmed the diagnosis, and, in the belief that if the jaw could be held in its normal position a cure would be effected, an appliance was constructed for that purpose. To a gold crown made to fit the only remaining right bicuspid was soldered a gold rod one-eighth of an inch in diameter and one and one-eighth of an inch long, upon the free end of which a coarse thread was cut. The rod was screwed into the ramus, the crown was placed on the tooth, and a vulcanite plate made to fill the spaces between the remaining teeth, which were held firmly by gold clasps. The appliance was adjusted May 13, and four days later another operation was performed, this time externally, and sterilized sponge was inserted upon a flap of periosteum raised from the bones. The sponge was removed on the 30th, on account of suppuration. Three months later the screw became displaced, and as it was found to be too short its construction was changed to allow it to be lengthened as necessary. January 6, 1887, the mouth could be opened an inch and a half, and there was marked improvement in the position of the jaw. January 26, twelve small pieces of bone from the lower epiphysis of the femur of a young rabbit were grafted, those upon the ramus uniting, while those upon the anterior portion of the maxilla failed, leaving a space of a half inch to be filled. This was attempted May 18, by transferring a piece of bone large enough to fill the space, also from a young rabbit, but the graft necrosed after sixteen days. July 20 the screw was again displaced and an upper denture on vulcanite, and a lower plate of Weston's metal and vul-

canite, made very heavy, were inserted. In two weeks it became necessary to rearrange the teeth, as it was found that the jaw had been carried a quarter inch to the left. As the patient had not experienced a single paroxysm of pain in either the articulation or the arm since the 8th of May, 1886, Dr. Marshall thought the treatment might be considered successful. The causes of the failures of the sponge-grafts he thought were the low vital condition of the patient, and in the first instance the difficulty of excluding the fluids of the mouth; in the second attempt, the large size of the graft. He was impressed with the possibilities of bone-grafting, the failure of the second attempt being due in his opinion to the fact that the graft was larger than the tissues could nourish. In bone-grafting three conditions should be observed: 1st, thorough cleanliness during the operation and afterward; 2d, the grafts should be small, and covered on one side with periosteum; 3d, the bone should be taken from growing subjects, preferably from the epiphyses of long bones.

Dr. Atkinson regarded it as almost a special providence that the case related by Dr. Marshall was presented, as it laid down the principles of grafting, and showed the folly of using drainage. Whenever a surgeon employs drainage he tacitly admits that there is something inside which must be got out. Though the paper was full of pathology, there was plenty of trash in its quotations. The neuralgia felt on the opposite side may have been reflex; all the rest was neuralgia by compression. The axis-cylinder of Schwann is semi-fluid, and capable of being pushed to one side. When the globules of neurine are near enough the current may jump from one nerve to another. The necessity of sterilizing all wounds is well shown, and we may learn from this case that the sponge-grafts do not take sometimes because they are not sterilized all through. All affinities act from the outside, whether in building up or tearing down. He had never seen a sponge-graft which was completely covered with healthy tissue that did not go on without a single drop of exudate. Any perfect peptone is a fit food for these microscopical elements, and the sponge-graft will make any tissue of the body. The reason why the wound did not heal when the periosteum was stripped from the ends of the bones and the sponge-graft was applied, is that there was not enough pabulum to form the coagulum. When the graft has been applied, let it alone till it has gone far enough to hold its own.

Dr. Marshall said his reason for not persisting in the sponge-grafting was that he apprehended that he was dealing with cicatricial tissue, which does not unite kindly by first intention. As to the sponge-grafting which was done, he put in large pieces because he

did not want to open up the territory again, for fear of getting into worse trouble.

Dr. Atkinson. The mischief lay behind all this, and was done before the case came into Dr. Marshall's hands. If the entire contour of the bone had been kept, there would have been no trouble.

Papers were read by title by the secretary, Dr. Dudley:

"Articulation of Artificial Teeth," by Dr. H. L. Cruttenden, Northfield, Minn.

"Power in Dentistry," by Dr. W. St. Geo. Elliott, London, England.

"Porcelain Crowns," by Dr. E. C. Moore, Detroit, Mich.

Adjourned.

(To be Continued.)

AMERICAN DENTAL ASSOCIATION.

(Concluded from page 21.)

THIRD DAY—*Evening Session.*

THE association met at 8.20 P. M., President Allport in the chair.

On motion, the sum of $1000 was set apart in the treasury, to be under the control of the executive committee, for the protection of dentists against the unlawful demands of patentees.

Section VII, Anatomy, Pathology, and Surgery, was called, and the report was read by the chairman, Dr. T. W. Brophy, of Chicago. The report announced a paper on "Sponge-Grafting," by Dr. W. H. Atkinson, and suggested as a subject for discussion the operation of implanting teeth. Dr. Brophy had little faith in the operation, but the results obtained by those who practiced it were surprising, although sufficient time had not yet elapsed since the earlier operations to determine their permanency and value. Though apparently a violation of nature's law, to expel non-vital or foreign substances from the tissues, clinical experience had already established the fact that teeth wholly devoid of vitality might be implanted and become firm in their artificial alveoli. The questions to be settled were, What change did nature effect to retain the implanted tooth? Does a new peridental membrane develop from the pabulum exudate around the root; and if so, does it become attached to the cementum and thus retain the tooth?

Dr. Atkinson's paper, in the author's absence, was read by Dr. M. L. Rhein, of New York. The sponge-graft was primarily adapted to the restoration of tissue traumatically removed, in which there had been no deterioration other than mechanical; and, secondarily, it was the best means of rapid reproduction of lost tissue from the

inflammatory process. In the latter case it would be necessary to enlarge the chasm of the wound sufficiently to go beyond the cirsoid or red line. Where there was enough living tissue to cover in the cavity without unduly stretching the flaps, union by first intention might be confidently looked for; but in case of deficiency sterilized gauze, oiled silk, gold-beater's skin, or other aseptic substance, must be used to complete the pocket in which the sponge was placed. The writer had yet to see the first case so treated, where there was no inflammation, that did not heal by first intention without the formation of a single drop of pus. The question as to what became of the sponge had not yet been satisfactorily decided. Dr. Atkinson then detailed the treatment of his first case of sponge-grafting, which had occurred three years previous. The pulp of an inferior central incisor had died, the caries from which had extended so as to involve all the external plate between the cuspids, resulting in an abscess which had discharged for years through a fistula in the chin. After removing the carious portions of the plate and the transverse processes where required, the wound was treated with aromatic sulphuric acid, then sterilized dressing, after which the sponge-graft was inserted. Two supplemental grafts, necessitated by portions of their predecessors not having taken, were required in the case before the patient was supplied with new tissue indistinguishable from the original structure to any ordinary examination by one not acquainted with the facts in the case. All first-class cases healed without any set-back in the shape of tardy closure, pus, sanies, or ichor. External dressings could be removed in from four to eight days, and the patient dismissed with assurance that there was no necessity for further care. Sterilization of the parts, of the external dressings, instruments, hands, and napkins, and whatever of gauze, silk, gutta-percha membrane, Husband's plaster, or other outward protection against the microbia of the air or those in the tissues requiring air for their growth and multiplication, was needful.

Sterilization of the sponge was attained by putting it into water, to which one grain of bichloride of mercury to the ounce had been added, and slowly heating it over a Bunsen burner or other means of raising the heat to 130°–164° F., and no higher, for fifteen minutes. When the sponge was inserted all the watery solution should be wrung out, to be sure none remained to dilute the exudate which formed the clot by penetrating the pores of the sponge and laying the foundation of the new growth. The site under treatment should be sprayed at least three times a day with either the bichloride solution above mentioned, or, which the writer preferred, a solution of one grain of potassic-mercuric-iodide to six ounces of water, in an atomizer.

Dr. M. L. Rhein, New York, had adopted sponge-grafting from the outset, and he could cordially indorse the statements of the paper, which gave every detail necessary to the practice of the method in closing deep wounds, where it yielded quicker results than the ordinary process of granulation. One or two points should be borne in mind. The wound must be in a healthy condition when the sponge is grafted, or there will be failure. The sponge-graft would reproduce every type of tissue. He had used it very extensively in alveolar abscess where there had been considerable loss of tissue, and in these the hard structure as well as the gum-tissue was reproduced. The iodide solution mentioned in the paper was to be preferred to the bichloride, because it was not open to the objection that had been brought against the latter as to poisoning and salivation. In making it a small portion of alcohol, say about a half ounce for a six-ounce solution, should be added before the water, to prevent precipitation of the red oxide of mercury.

Dr. W. N. Morrison, St. Louis, Mo., had presented a paper on transplantation and replantation before this association in 1876. One of the cases reported then he had showed to Dr. Younger last year. The odontoclasts were at work on the root at one time, but he had called the attention of the patient to the means of arresting the trouble, and the tooth was still in good condition. By producing friction daily over the gum with the finger, the angry condition was improved, and the use of a soft brush and a dentifrice of alcohol and prepared chalk had sufficed to keep the tooth in comparatively good condition, though a certain amount of destruction had taken place. He had not so much confidence in the results when a dead tooth was implanted as when freshly-extracted teeth were used, but Dr. Younger's successes had intensified his feeling on the subject. The cases mentioned by Dr. McKellops, where teeth were drilled through the sides in opening the canals, were just the kind of cases in which replantation was justified. The holes should have been filled and the teeth replanted, when there was no reason why they should not have been retained for years.

Dr. C. H. Harroun, Toledo, O., had replanted a tooth at the University of Michigan in February last,—a left central incisor which had been knocked out some eight weeks previous. The teeth of the patient were affected by pyorrhœa, and stood apart from one-sixteenth to one-eighth of an inch—not a very favorable case. The tooth was prepared as Dr. Younger directs; it was kept in water at 120° F. for a half hour, and disinfected with bichloride. The socket was made with a special drill constructed for the purpose, from an old-style hand-piece instrument, which was flattened and twisted and then tapered. The jaw was penetrated three-fourths of an inch, the

tooth inserted, and wired in with a silver suture. The tooth was still in place and doing good service some fourteen weeks afterward.

The subject was passed.

Section I, Prosthetic Dentistry, Metallurgy, and Chemistry, was called, and the report, by Dr. Harroun, the chairman, was read by Dr. L. D. Shepard, of Boston.

The report stated that but very little that was new or valuable to dentists had been brought out in the realm of chemistry during the year, a fact which seemed to indicate that too little time was given to this basal study. In fact, it would seem that there were but few chemists in the ranks. In metallurgy, the easier and cheaper methods of making artificial dentures brought about since the introduction of vulcanized rubber had caused a retrograde movement, until to-day dental laboratory work is below the standard of twenty-five or thirty years ago; and few of the leading men now do anything in the laboratory, but send this portion of their work out to be done by the "mechanical" dentist. In prosthetic dentistry, gold crown and bridge-work offer much that warrants careful study. Dr. C. C. Carroll, of Meadville, Pa., who as the result of a great deal of experimentation with aluminum had finally succeeded in devising methods of casting, welding, and soldering this hitherto intractable metal, had consented to give a clinic demonstrating his processes of making artificial dentures on aluminum base. Metallic linings for vegetable bases should be mentioned as possessing some hygienic advantages. The crown die-plate, introduced by Dr. E. T. Starr, appeared to be a useful device for facilitating the construction of crown and bridge-work; and Dr. Woodward's self-packing vulcanizer seemed a simple and effective device for its purpose.

Dr. C. P. Southwell, Milwaukee, Wis., thought prosthetic dentistry a department in which all should take an interest, particularly those whose practice was small and who necessarily worked in both branches of dentistry. There was a large mass of dentists who did their own plate-work, and a small mass who did not. Failures often occurred through neglect of the little things. For instance, there were three screw-bolts in the Hayes flask. If the set-screws were not put on right there would be a spring in the top; the next time the screws would be put on differently, and there would be no spring, because the packing would be too dense. Then, leaky vulcanizers were caused in the same way. If the vulcanizer and its cap were marked when first bought there would be no difficulty. The cap would be put on every time the same way, and there would be no leakage. Another thing, if the vulcanizer is closed with cold water in it more air will be inclosed than if the water was hot, and if it is not allowed to escape you may be vulcanizing at 330° F. when you

think it is only 320°. If using oil, stop the flame at 310°; it will run to 320°. If stopped at 320° it will run to 330°, and if cold water is used to 340°, and then the wonder is why the vulcanizer bursts. Almost invariably the lower jaw is broader than the upper at the base, and almost as invariably dentists in making plate-work don't stop to see where the leverage comes. If the teeth are set at one angle, the leverage being on the outside, the plate will tip in every direction. Another trouble is that so many fail to take the bite right to hold the mouth in good position.

Dr. A. O. Hunt, Iowa City, Ia., thought dentistry had reason to be particularly proud of the methods of casting aluminum which had been demonstrated here to-day, as it settled the claim that dentists were scientific men. Chemists and metallurgists have been experimenting for years to discover a method of soldering aluminum. In the ordinary course of a dentist's practice it has been found, after all the known fluxes have failed, that the way to solder it is to keep everything away from the surfaces to be joined; simply to be sure that the surfaces are perfectly clean. Beyond question this was one of the most wonderful discoveries in metallurgy for many years, and we ought to be proud that to a dentist was reserved the honor of discovering the secret. The speaker had to-day seen for the first time the manipulation of aluminum. The time necessary is but little more, and there is little more expense attached, than to the making of a rubber set, though it may require more skill. Those who had attended the clinic by Dr. Carroll to-day saw almost the whole of the operation of making a dental plate of aluminum. The operator entered into the use of aluminum in making what he called bridge-work, which was not bridge-work, but a very simple plate. He was anxious to see the flask opened, as a check had occurred, and Dr. Carroll forced more of the molten metal into the flask, and this would be a test as to whether aluminum would weld or not. He appreciated the suggestion that not everybody would be successful in working this metal; a considerable knowledge of the metals and of chemistry would be necessary. The statement had been made that it was possible to extract aluminum from ordinary clay. Eleven ounces had been extracted in a blacksmith's forge with natural gas fuel from four pounds of clay.

Dr. W. P. Horton, Cleveland, O., thought that prosthetic dentistry meant more than what used to be known as mechanical dentistry. Every dentist up to the times ought at least to be able to construct in wax the features which it was desired to reproduce in the plate, and then when the case was put into the hands of the workman he should reproduce what was shown him. With reference to aluminum, he thought there would be two difficulties,—first, in obtaining alumi-

num of sufficient purity, and second in the increased price over other materials which have been used.

The subject was passed.

Dr. W. S. How, Philadelphia, offered a resolution directing Section II to report a plan or scheme for the introduction of a course of elementary instruction in dental histology, anatomy, and hygiene into the public schools, in accordance with the suggestion to that effect in the report of the Section, which was adopted.

The newly-elected president, Dr. Frank Abbott, of New York, was installed, and briefly acknowledged the honor.

The usual resolutions of thanks were adopted, the minutes read, and the association adjourned.

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting Tuesday evening, November 8, 1887, in the New York Academy of Medicine, No. 12 West Thirty-first street.

The vice-president, Dr. J. Morgan Howe, in the chair.

Incidents of Office Practice.

Dr. C. E. Francis. Whenever I am fortunate enough to find anything new in instrument, remedy, or appliance which has proved valuable, I like to speak of it, in order that others may be benefited. I have long felt the need of a good syringe for injecting medicines into the pulp-canals of teeth, and have searched the depots in New York and other places, hoping to find one suitable for the purpose. About a year ago Dr. Ives exhibited one before this society, which was the best I had then seen, and I procured one. It is a beautiful instrument, but has this objection,—when charged with carbolic acid or other fluid, and an attempt is made to force the fluid into the cavity, the piston will sometimes stick, and the fine tube becoming bent may cause the medicine to get into the mouth. A while ago Dr. Barrett, of Buffalo, informed me that he had in use a medicinal syringe that was the best he had ever seen. I immediately procured one, and never have I experienced such satisfaction in treating root-canals as since I possessed this little syringe. It is somewhat like a drop-tube, but possesses much force, and requires but the thumb and finger to work it. With it you can inject a drop or fraction of a drop. It is the device of Dr. J. A. Dunn, of Chicago. I would not be without the instrument for twenty times its cost.

Dr. S. G. Perry. A gentleman recently came to me with an up-

per incisor in his hand, saying that his wife had told him he must not throw it away until he had seen what I could do with it. I cut the crown off the root, selected another root a trifle larger and longer than the old one, and grafted the old crown on to the new root with platino-iridium wire and oxyphosphate. I then reamed out the socket in the jaw, deepening it slightly to receive the increased length of root, inserted the tooth, tied it in place, and told him to go home and be happy. Two days after he came in and said he had been happy, attending to his business as usual, and had forgotten the tooth. Four or five days later he came again and reported the tooth comfortable, and growing firm. I have since heard through a member of the family that it is an absolute success, as it gives no trouble whatever. I speak of this only to call attention to one point. I was able to use the original natural crown of the tooth, which it would have been a hopeless task to attempt to match. It is often found that the teeth available are not of the right size or length to transplant; and if these operations prove, upon longer trial, to be of as much value in our practice as we have thought they might, it seems to me that we may find a way out of that difficulty by grafting a natural root upon an artificial crown. It will be a comparatively easy matter to find roots that may be fitted; we may even take the root of a bicuspid, or the palatal root of an upper molar, for use in the front of the mouth.

Dr. Brockway. What occasioned the loss of the tooth that you speak of?

Dr. Perry. Old age partly. It dropped out. The patient said it was much better after I replanted it than it had been for a long time. I have quite a number of other cases of replantation and implantation, but I will not take your time to mention them now.

It does not seem to me that any dentist's office is complete unless it be furnished with an outfit of matrices of one kind or another. For years I have been shy of them; I have been afraid that I should not make as perfect an adaptation of the filling to the margins of the cavity by the use of the matrices; but after a longer trial I have to admit being, to a certain extent, a convert to the use of the matrix. I have many forms of them. I had great satisfaction from the use of Dr. Brophy's matrix, as also the English matrix called the Brunton-Ladmore. Dr. Woodward, my associate, has devised a set of matrices which you all have seen, and I have used them with a great deal of satisfaction; but I have never been quite satisfied with any one form of matrix. There is such a variety of cases that no single matrix has met the requirements of all. The matrix which has given me the most satisfaction is one that I have devised, and a sample of which I have here. It is simply a strip of metal intended

to go about half way around the tooth, and having a hole drilled through each end (Fig. 1). It is fastened around the tooth by means of a threading cord or floss silk, which is passed through the holes and tied fast with a double or treble knot (Fig. 2). The knot can be pushed out of the way upon one side of the tooth. The usual fault with matrices of this character is that they are made in different parts, one or more of which is liable to fall upon the floor, and they are in other respects difficult to manage. This one is very simple.

Fig. 1.

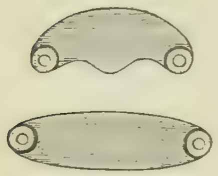


Fig. 2.

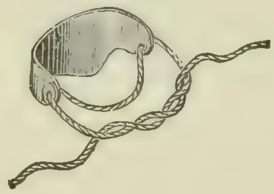
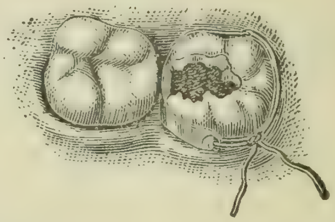


Fig. 3.



You pass the threads through the holes in the ends, place the matrix where you wish to have it, wrap the thread around the tooth, and tie it (Fig. 3). If it stretches a trifle there is no harm done, because in packing gold there is greater certainty of a close fit at the margins if the matrix yields a little. The matrix is made of very thin steel, and, to prevent it from cutting the thread with which it is tied, small pieces of metal are soldered to the ends, and the holes for the thread are drilled through those extra pieces of metal. This makes it so thick and firm that the thread can be drawn tight without danger

Fig. 4.

Fig. 5.

of cutting it. This matrix is not universal in its application, and I would not be without the others; but it is, in certain cases, the best device that I have used. The holes are drilled in such a manner that the thread comes near the cervical wall, and the matrix is made to hug the tooth at that point. If it does not, a wedge of wood dipped in sandarac varnish, and pushed between it and the adjoining tooth, will cause it to fit well at the cervical border. This matrix is equally suited for gold or other plastics. It is particularly neat when amalgam is used, and it is often desirable to leave it on the tooth for a day or night. To avoid obstruction, I use many

narrow forms of this matrix, some of which do not cover more than one-third or one-half the length of the tooth.

There is another use to which the same matrix may be applied. It is that of adapting it by a simple method of binding and tying to any of the other teeth. Reference to the cuts will show how it can be easily applied to the incisors, which almost always should be filled from the lingual side (Fig. 4), and to the bicuspids and molars (Fig. 5), which can be sometimes filled from the buccal or lingual side without cutting down from the grinding surface. To one who reveres the shapes of the teeth this is an operation that is most satisfactory, and by the aid of this simple matrix it is more easily performed.

The President. Gentlemen, we will now have the pleasure of listening to a paper by Dr. Bonwill.

W. G. A. Bonwill, D.D.S., of Philadelphia, Pa., then read an essay entitled

Amalgam: Its Uses and Abuses—Methods of Insertion.

Since the cold reception given to the "New Departure," no one has deemed it prudent to openly advocate the use of amalgam, although its employment was not curtailed to any great extent. The "cold wave" was not without its sequel of advantage in arousing the profession to look more closely and honestly into the respective claims of the combatants. Good, I think, has resulted rather than harm. Those who had previously used it could not well consume more; while its enemies used no less. The very few who swore they never did use it possibly remained neutral. That it did arouse certain of these neutrals, whose hands needed no washing from its stains, all remember from their acrimony.

In my opinion, there was not an answer in any fairness and courtesy to the main issue. Abuse and ridicule ruled the hour. That the trio who promulgated its philosophy were honest in their convictions, I have no doubt. Unfortunately, however, they reasoned "without their host." Had any of these discoverers been adepts in the use of the best methods of filling with gold, and had they consulted with those who had been successful with gold, I am sure they would not have been so dogmatic in prescribing for universal use a material which is good only when intelligently used. They were too sure of their game, and lost immensely of their prestige by being too hasty. To strike at the foundation of a century's work, which was improving every day as education was more general, and a larger number of good men were coming to the front, was not safe.

It was well that amalgam should have its hour of trial as proof of its value and power. It had stood comparatively well, and, as

was apparent, had "come to stay." Gold had charms to every dental artist who had become expert in its manipulation; its trials were great and its weakness was seen by those who were its friends. *Per se* it was all right. The fault lay at the hands of the operator and surroundings. So much had been said against amalgam, that experiments were made privately. This bold effort of the trio to push to the front an improved article, at the expense of the character of so high-toned a metal as gold, must needs meet with a like boldness to uphold it. Then the trio, while not scientifically answered, were discomfited and made to recant by modifying their creed. The pendulum came to rest; and, while the creed is not accepted, a better feeling exists, and the improvements made in the article and the mode of placing it into cavities, and the more thorough preparation of the latter, have given assurance of reason having again taken her throne.

Speaking for myself, I have no apology to make for its advocacy. I used it cautiously, after I had passed the age of prejudice, in the first eight years of practice. For a while, after getting the electric mallet and dental engine into shape, in 1869, I was so infatuated with gold that I quite lost my head, and my cry was "onward," and down with amalgam, although I had not been extravagant in its use. When I removed to Philadelphia, in 1871, a new era confronted me. I found that, while I could build up a structure with gold to any height, many reasons were soon offered, from failures of my own and others, to seriously warn me that there was a limit to my ambition, and I cried a "halt!" The rescue came in a new mode of crowning, in 1873, by the "nut and bolt," and soon after, with the "all-porcelain crown." But I found many partial crowns too good to be cut off. Amalgam, I had learned, had some good qualities, and I anchored all my pins with it after having failed with gold for that purpose. In my effort to conserve all the structure of the root, and use large pins, I had but little room to press in the amalgam around the pin. This obstruction I soon overcame by the use of Japanese bibulous paper, which, when placed over the amalgam, enabled me even with the thinnest blade of steel to compress it high up in the root and absolutely solid and firm at once, as it pressed out all the superabundant mercury. This application of the paper was at once applied by me to the consolidation of all amalgam fillings. I was now satisfied I had reached a point when I could safely rely upon this hitherto uncertain article. In due time, after severe tests, I gave this method to the world, confident it would insure results which had never before been possible by any other method of manipulation. Like all other good things freely given, it was not appreciated at first. It has been gaining ground, and

one of England's celebrated dentists was pleased to say and publish that it was the most satisfactory method ever advanced, and that he "would have crossed the ocean to have seen its use." That it has had a determining effect upon the future career of amalgam, I need give no stronger evidence than its history in my own city. Up to the advent of this truly new discovery, the schools there would not allow anyone to give a clinic upon filling with amalgam. One professor said "it made slovenly, careless operations," and "it would be especially harmful if taught in our dental colleges," although this same gentleman had, shortly before his professorship, been a manufacturer of amalgam. Another high-toned dentist of our city, at the same meeting, went so far as to assert that "*all men who are falling away from manipulative ability will lean on plastic materials, but it is an unphilosophical way of dealing with the subject.*" One said he was afraid to have physicians know he used amalgam at all. One of the trio was not allowed to give clinics in his own college, but was forced to do so in his private office. The use of bibulous paper in manipulating amalgam was finally admitted as yielding superior results, and in 1883 I was permitted to give a clinic in each of the colleges in our city, and have done so ever since. Does this not show that there has been a wonderful advance in so short a time? What caused it?

While the professors were honest and right in their fears from its introduction to their classes, they were perfectly willing for me to clinic; for they had the assurance that, if I could afford to advocate plastic materials, when I had spent so many years in inventing and improving machinery for the better preparation of cavities and for packing gold, I must assuredly be honest in my convictions. Had I not so frequently demonstrated for years, here and elsewhere, before hundreds of students and practitioners, that I was capable of manipulating gold both by hand and by malleting, they would not have permitted such an innovation.

One prominent dentist of your city said, "Bonwill, I am surprised at your advocating the use of amalgam when you have the best machine in the world to pack gold. You should fill all teeth with gold."

The teachers then saw I was honest in my convictions, and my mode offered such inducements that the time had arrived when they could safely permit me to go before their classes. The profession at large must give me credit for this bold effort to uphold amalgam,—not as a *sine qua non;* not that gold should be totally abandoned; but as a grand adjunct, where faithfully and judiciously used, in saving thousands of teeth, *by those who know not how to manipulate gold*, and as one of the greatest of boons in the hands of those who know well *how and where to use gold.*

I have made one mistake in my experiments in making alloys of tin, silver, and gold. When I placed pure gold in the mercury, to enable me to control a larger amount of it in the alloy than I could possibly do in the crucible and have it easy of manipulation, I made a mistake, but fortunately found it out before much mischief was done. It was the greatest mistake of my life. It would not have gone further than my own practice but for the clamor of others for it before sufficient time had elapsed to see results. So far, I see no reason to abandon the use of seven per cent. gold in an alloy of tin and silver mixed in the crucible if placed in the cavity under heavy pressure with bibulous paper. There are other good amalgams that will be found to give better results when treated by this new-mode manipulation. Therefore, gentlemen, you who have not tried it, do so and you will grant it to be a revelation which will cause you to think more of amalgam. I only wonder, at this late date, how I ever made my alloy fillings compact and contour by simple pressure of a blunt piece of steel. Talk of rotation being a big improvement over the mallet system! It is nowhere in comparison to the value of this new method in forcing and consolidating amalgam; the very thing of all others that needed a push and the support of some creditable operator.

Dentists generally are not willing to advocate the use of amalgam and have their remarks paraded in the journals. It is disgusting to see so many who are afraid physicians will ruin their practice. Against such sentimentalism I have ever entered my protest, and have dared to advocate whatever I have found to be of advantage, presuming to know more about dental science than any M.D. Thus far I have lost a few patients and one medical man from my ultra use and vindication of its character.

[Dr. Bonwill related several cases illustrating the prejudice which some physicians indulge as to the poisonous effects of mercurial fillings and rubber plates.]

In an article read before my own society in Philadelphia, in May, 1881, I presented the following points: The Salvation of the Human Teeth. How shall it be Done? Adaptability vs. Compatibility. Success and Failures.

At great length I gave my reasons why incompatibility was not a factor in saving teeth. My creed then was what I have found satisfactory up to this date,—that the predisposing cause of caries is principally due to the physical law of capillary action, where two adjoining approximating surfaces are in such contact as to form a capillary tube of the surfaces of the walls; that caries attacks first the finest part of that tube or the surfaces *near* the point of contact; that the point of contact is never first involved; that the active agent is

starch or its products, and then chemical decomposition acting chiefly on lime-salts, as well as acid of various kinds acting immediately thereon; that decay can be anticipated by timely action and judicious treatment in many cases, and, if not arrested early, will surely destroy the tooth-substance of seven-eighths of the children of the present generation, and filling will have to be the sequel; that decay once commenced, it is of no consequence whether the filling be of compatible or incompatible materials,—it will not be corrected unless this same law of capillary force is observed and the approximal surfaces of the fillings and teeth are modeled as I model them in anticipation; that gold *per se* will protect dentos from future attacks of caries if placed in teeth which are so adapted by situation, size of decay, and general surroundings as to enable an expert in its use to have access to the cavity, and if the physical law laid down is observed,—otherwise it will fail; that amalgam and other plastic fillings will save dentos from further decay only on the same physical law and their better adaptability to the situation; that the theory of incompatibility to dentos and consequent galvanic action in proportion as they are incompatible has nothing whatever to do as a factor in permitting caries to again commence after teeth have been filled, any more than it was the first exciting cause of caries in solid dentos; that adaptability of dentos to material and material to dentos, skilled hands, a brain equal to the task, and the final observance of the law of capillary force, will on common physical principles, well understood and capable of demonstration, save more teeth than by acting on the law of incompatibility; that *no theory or law*, however positive or well understood, can be succesfully applied so long as we have in our ranks men who are neither compatible nor adaptable to their positions; that, in connection with well-grounded principles of practice, we must have men who are skilled artisans, and who know how to use their digits, with a dental training first as a *sine qua non*, and finally with a medical education,—so far as the general principles of surgery are concerned, the more the better;—with such men going out from our schools we can hope to keep in check, if not to annihilate, this monster caries.

To all this we may add that, unless dentistry is practiced as a noble profession, and not as a trade, we cannot expect to rise in the world's estimation as laborers worthy of our hire, but will continue to fail, and be set down as mere money-makers, and unworthy of our exalted calling.

This creed I am sure all will admit is reasonable and practicable.

Conscience, ability, and experience must tell in this fight to suppress caries. It is well to listen to the wranglers who are ever debating theories of micro-organisms or chemical action as the active

agents; but let us keep our wits, and observation will point the way if we have eyes to recognize facts, which I believe are simple. Talk of antiseptic remedies! My great sustainer is dynamic antiseptics. I feel that thirty-three years of my own practice have taught me something, and that my own failures as well as those of others have been equally potent in showing me the way.

To give you a reliable reply to why I use so much amalgam, and not so much gold, I must tell you where I believe I have failed in the prevention or recurrence of caries. It is not necessary for me to go into an elaborate scientific disquisition on the metals composing amalgams,—how proportioned; how to insure against changes; the laws of spheroidal bodies; the escape of mercury when once in the mouth, and all the minutiæ of the metallurgist; these you will find in text-books and magazines. Suffice it for me to feel that I have reached a surer and more steadfast footing in the use of all the materials we are now employing for stopping decayed teeth. Enough for me to impress upon you that we must rely on one another's experience; that we are now so far advanced in technical knowledge that, when one makes an assertion backed up by a long line of practical results, it *must be accepted.* Some demonstrations appeal at once to our good sense, and analogous facts corroborate. Because I have made some mistakes, you cannot go on forever doubting all I may say and do. Why all these meetings, if it is not to advance? Do we not bewail time and again our inability to cope with the workings of nature? How often we confess that we are little more than "pebbles on the seashore." I have met failure on every battle-field of practice, but have never given up the contest.

Then, gentlemen, while I am not here as a Solomon or an oracle, I do claim to have reached some practical results that it will not be amiss to have you investigate. If, as says Herbert Spencer, "all our knowledge comes from *experience*," then let us each record our life's or every-day's work. I feel highly honored that I should have this privilege before men who, while they have not always been liberal, are fast coming to it. Education, even a little, is a potent factor. Our deeds and actions are constantly being placed in the light, and we cannot squirm away from contact with the world and our brethren.

I have given you *my creed.* To be consistent, I should speak of all *plastic fillings.* That you may comprehend my practice, I shall speak of gutta-percha as one of my greatest allies. The several classes of cases which come to us for rescue are: Children from two years onward who have never been to a dentist; adults who, having postponed until the eleventh hour, have never been treated; adults who

have gone to the family dentist from childhood, and from loss of fillings, pain, pulps treated, extraction, and artificial teeth, have finally gone to another; the millions who have but little money to pay the best and most competent dentist. It is a great tax, as skilled hands and brains find they must be paid liberally, but we must look to *their* interest and welfare as well as to those who can pay us all we ask.

I have ever held that "*duty must be done though the heavens fall.*" Could anyone dare to be so cruel as to fill any temporary tooth with gold? I am happy to say I have witnessed but few such criminalities. The sixth-year molars I rarely fill with other than amalgam, unless the pulp is nearly exposed, when I use oxyphosphate or gutta-percha, with a bridge of tin at the bottom of the cavity to keep off pressure. For approximal decay between temporary molars I use a pointed fissure-bur, leaving a point of contact on the grinding surface, and then, after removing decay, without regard to shape, fill in between from the buccal side with pink gutta-percha rolled into one piece. If the cavity be wet, the working of the gutta-percha in from the center will make the mass solid. If I were to attempt to make separate amalgam fillings here, the pulp would suffer and decay be sure to recur from want of space. If the approximal and grinding surfaces are both involved, the pulp has usually by this time disappeared, and I combine all the surfaces and use amalgam. I always tap such pulpless cases of temporary teeth. I would fill the temporary incisors with amalgam; never with gold, and not often with the oxyphosphates or gutta-percha. In large approximal cavities through to the grinding surfaces, where there is no chance of shaping the cavity for amalgam, I invariably pack in pink gutta-percha in one piece. This can be eaten upon, and renewed or patched easily. We cannot always contour such places with amalgam, and the gutta-percha arrests and prevents decay, and leaves no chance for accumulation of food. The perfect adaptability of gutta-percha to cavities even with moist decay causes it to save when nothing else will. The quality of expansion from constant mastication and 98° heat keeps it against the walls, its self-adaptation rendering it without an equal in temporary teeth. I have seen fillings of it rolling around in the cavity where apparently no further decay occurred.

If the permanent teeth show signs of early decay on the grinding surface, I use amalgam, for I know that the approximal surfaces will soon be involved, when all fillings before placed in would have to be removed and a compound one inserted involving both the surfaces named. It would still be a question how soon I would use gold. If I am so fortunate as to discover decay before it has reached any depth, and can cut it out entirely, I do not fill. But caries in

the present generation of teeth is so insidious that true anticipation cannot be practiced but in a limited way. The teeth are no sooner in contact than destruction begins.

When a child's temporary teeth will permit of thorough and wide separation, with square shoulder at the cervix, I feel safe; but not many will. The cutting away of the distal surfaces of second temporary molars will save many mesial surfaces of the first permanent molars.

Amalgam and gutta-percha, then, are my sheet-anchors with children. The abuse of amalgam here is that, from its ease of adaptation, it is used without judgment. When you consent to filling up all intervening space with gutta-percha, you will have made a vast stride for the comfort of the little ones. It looks unscientific and not very high-toned, but it keeps the mouth clean and fills a mission. A ball of it pressed into a wet cavity will, when held in by the opposite tooth, prevent further decay, and its use in the manner described makes more room for the permanent teeth when erupting, and there is consequently much less crowding.

What am I to do with adults? Just here I want to correct a false impression about my practice. Because I have advocated the anticipation of decay by self-cleansing surfaces, it has been supposed that I made all my approximal surfaces flat, leaving the teeth to approach each other, a greater surface for predisposition to caries resulting. For more than ten years I have scarcely placed in a flat-faced filling. Soon after going to Philadelphia I found that my practice was largely devoted to teeth once separated for filling, that had so encroached on one another as to need to be pressed into their former positions to maintain proper occlusion. When *in situ* contour fillings only could retain them. Power malleting was a fact, and we knew that contouring with gold would stand. The mania with too many of us then was *gold towers*. It was so enchanting to rear them. We builded well, but not wisely. The true philosophy of contouring was not apprehended then, nor really is it now by the bulk of operators. Failures occurred so frequently that friends were turned to enemies, and flat fillings again came into vogue. I soon saw where the vulnerable point of attack was. Too great haste in filling with gold before the teeth had been properly wedged, together with the failure to recognize the fact that contact of tooth-substance was dangerous, gave the death-knell to many fine specimens of art or gold-building. The next weak place was that, so many cavities being practically inaccessible, it was difficult to avoid leaving a space unfilled or the gold not driven against the walls perfectly. Again, many feared to cut away enough sound tooth-structure so as to carry the periphery of the fillings far beyond the boundary line

where no tooth-structure could possibly approximate. *Arthur's style of separation had made many fear to cut tooth-structure away, even where it was to be replaced with metal.*

The scare led to the other extreme, and too much surface was allowed to remain in contact to again decay because the predisposition was not removed. Too many buccal walls were left that should have been cut away, and the cavity, to have a genuine shape for gold, was not carried to the cervix and under the gum, for fear the dam could not be placed on. To use a separator in order to fill immediately, when the cervix is still very close to its neighbor, is but to court decay, ten to one, no matter what material is used. I am opposed to it! Patients, after spending time and money, finally grew tired and disgusted, and sooner than submit to a repetition of such operations would demand the next best thing. Aside from the patient, the operator has but one life, and he has to look out for health and a "rainy day."

With all the advantages machinery could give me, I grew tired and disgusted with so many failures of others crowding upon me. I had enough to do to rearrange my own cases.

A great temptation to use amalgam came when I had found crowning a success. The disposition with me was, when I felt gold should not be used in any tooth, to cut it off and put on a crown. I did not fully know then how to manipulate amalgam. I look with alarm at the pendulum swinging so far with those who make a specialty of crown and bridge-work and sacrifice teeth that amalgam could save.

Gentlemen have no idea how neglectful they are in not looking into the manipulation of alloys. Could the same interest be aroused in that as in other matters, we would be making a vast stride in progress. Could you be assured that amalgam could be as easily and successfully used as crowning, I feel that the latter would be as infrequent with you as it is with me. Do not feel that because gold cannot be used no effort should be made to save the tooth with amalgam. You have no need to prepare the cavity as though gold were to be used. Shape the cavity without fear of the spheroidal tendency of amalgam; the contour is sure to stand, and the use of amalgam will enable you to save a class of teeth which you have hitherto condemned.

Failure to secure an amalgam that has the best qualities, irrespective of price, is another cause of ill success. Fear to ask as high a price for an operation as is justifiable, when nothing else can save, has caused slighting. Another thing to be remembered in certain work with any metal is that the molars should be more widely separated than the bicuspids. Their surfaces are so much deeper and

wider that the capillary action is very great, and one can look for decay unless the separation is in exact ratio to width. These are the principal causes of failure from amalgam as well as gold. Many more could be enumerated.

Unless the grinding surfaces of bicuspids and molars are of good texture, by all means cut down all prominences from which the opposing tooth would be likely to break off pieces, and a leak occur. Overlap all weak walls; but let all angles subject to attrition be obtuse and of a depth to insure resistance.

The use of too many amalgams in the same mouth, and often in the same tooth, will, if even slightly dissimilar, sometimes set up a galvanic action which will darken and consume the more oxidizable metals. Get a good amalgam and stick to it, and if you have to fill against an old filling, remove enough to have all the exterior of one kind. A not infrequent cause of failure is the use of pink gutta-percha in a cavity as a lining under amalgam. I have seen the metal oxidized, and in some cases where but slight undercut had been made the edges of the amalgam were projecting. I use oxyphosphate as a capping. Large triple compound fillings should be anchored well down into the pulp-chamber—when the pulp is dead. Two pins in roots set in amalgam will never give way.

Crown-work has gone too fast, and that grand intermediate between it and gold—amalgam—has not been allowed a chance in the saving of the remnants of natural crowns. I place on very few crowns of any kind, for several reasons: First, I seldom lose among my original patients so much of the crown as to justify it; secondly, the use of the mallet by power enables me to securely build on a gold crown, when parts of the wall remain, in such short time, and with less inconvenience to the patient, than the putting on of a cap or crown of gold; thirdly, the method of impacting amalgam used by me is a happy method for building up all molars in a remarkably short space of time.

If I can once convince you of the correctness of my position in this new method, I am sure amalgam will no longer be held in subjection, but be looked upon as having a place not second to gold, but on an eminence equally high.

Let me speak now of the spheroidal tendency of amalgam. It is true that, unless amalgam is worked very dry and much time is consumed in building up, it will leave the margins. This new system so completely overcomes this that, where the alloy has been securely packed under paper, and a few slight pits at opposite points are made, I am confident of success. The complete removal of surplus mercury insures absolute hardness before the filling is completed.

Another cause of failure with this abused, though much used, article

is that many good gold fillings are allowed to remain on the grinding surfaces where approximal walls subsequently decaying have compelled the use of amalgam, and it is thus brought into direct contact with the gold. Take out the gold if you want proper anchorage, without cutting so much as to expose the pulp on the approximal surface. If you do not the alloy grows dark and unsightly, and nothing is added to its value for preservation from oxidation. Besides, the tooth is much better supported by all amalgam. If a gold filling needs patching at the cervix, or on any of the margins, and gold cannot be made practicable, then do it with amalgam or pink gutta-percha. I have seen, to my disgust, amalgam fillings patched with gold in order to set up galvanic action. Oxyphosphate is a good thing on the margins of cavities where the metal would show. It stands well in conjunction; gutta-percha does not.

It is very justifiable to allow a contour gold filling to remain in an opposite cavity to be filled with amalgam, for if the latter has much gold in it the color remains quite as good as if touching a similar metal. The security, however, against shocks is to wedge well before contouring, and let them keep in constant contact, not opening and closing a circuit by intermittent touches.

The New-Departure idea that a leak forms a battery where it is against dentos is too trifling. The chemical action, if an acid be there, would take place simultaneously upon each, and would dissolve dentos, whether permitted to touch an opposite surface of amalgam or of dentos. The acid will act as a solvent, and not galvanically, and does so just as rapidly and effectually on a smooth surface, at the union of dentos and metal, as at the point of contact. No better evidence is needed to disprove incompatibility as the cause than that, when an amalgam filling is placed in close contact to the approximal surface of a perfect natural crown, so that the same capillary surfaces are made as in nature, decay will as surely go on as if gold had been used. If more compatible than gold, there should have been no caries. This is also a fact when a porcelain crown is placed up tightly against sound tooth-structure; decay will result where the crown is allowed to touch at the joint between dentos and amalgam or gold.

Do amalgams alone, or in contact with gold, or in combination in the same tooth, neutralize acids that are forming from decomposing foods? An acid will always act on the element or substance for which it has greatest affinity. The greed with which it attacks dentos, and leaves amalgam merely darkened, is significant of its strongest attachment. Besides, all have admitted that, as soon as oxidation commences on the alloy, the tooth is safe in which it is placed as well as the approximal one. It does not longer act on

the metal. Then where is its virtue in oxidation or neutralization of acids?

Gutta-percha is truly compatible, but in a dynamic sense only,—not chemically, or because furthest removed from dentos. Acids will not act on it. It is so plastic and yielding under pressure, even when hardened, that when once in a tooth the mechanical union is so great that capillary action is impossible. There is no galvanic or Faradaic action of the acid on gutta-percha, but there will be on the dentos if the former is in direct contact with some other filling, or tooth, or crown, it does not matter which; decay will go on if the dentos has any accumulation upon its surface at any point near the gutta-percha.

An oxyphosphate filling is compatible mechanically, not chemically. It will disappear sooner than dentos by the direct action of an acid, and save it only as the acid has greater love for it than for dentos.

All metals are irritants in the ratio of their conductivity,—arousing inflammatory action of the pulp and tooth-bone. Gold is more so than amalgam. Too great haste in packing either metal is a most potent cause of shock and injury, which in so many cases prove fatal to the pulp unless the filling is removed very soon after detection.

I cannot dwell upon this part of my subject longer, but pass on to the importance of *that greatest of adjuncts as to dynamic properties of any material known to me*,—I mean pink gutta-percha.

We must have much space between molars or we cannot hope for success in contour work, which in my estimation, when properly understood, is the key-stone to keep apart the arches; they certainly collapse as soon as the key-stone is removed. The cardinal principles upon which I now act—and twelve years or more attest them—are: First, the proper shaping of the cavities for retention of fillings, and offering least cause for subsequent recurrence of caries; second, the separation of the teeth by pressure slowly exerted, after all weak walls have been removed, until the cervical, buccal, and palatal walls are so far away that nothing but metal can touch metal, destroying all capillary surfaces or tubes for retaining decomposable food at a point for direct action; third, the choice of such materials as we know have proven lasting, and their judicious application to each case, so that nature will not rebel against their use from the want of adaptability to meet the two previous principles; fourth, the best method for introducing said filling materials, which, while insuring them for the longest time, is done at the least expenditure of the patient's energy and tooth-substance, and with the least pain; fifth, the second principle is carried out to the fullest by the use of pink gutta-percha as a stopping, which I allow to remain in the cavities until the teeth are separated without any doubt.

Sometimes a year or more is consumed before the spaces are made. It is not a question of time whether I fill to-day or next year. To have the spaces wide enough, is the law. I have already taken space into consideration. "Be slow in haste," is wisdom. As to the operation proper of bridging the chasm, do it as quickly as possible with your ability to expedite work. With quick-setting amalgam, of proper grade, you cannot be slothful, though there are those who think that when they have the "dam" on they can take all day for it.

In approximal cases, where I have not the space, I first cut out and partially prepare all the cavities in the mouth, let these be few or many, and wad the pink gutta-percha into them, filling the entire space. If a pulp is nearly exposed, I use thick oxyphosphate as a capping. White gutta-percha requires too much manipulation and too strong heat; besides, it will not allow that expansion in mastication which is the grand desideratum for space. Here you seldom need the dam. Aside from space gained, the gum at the cervix is so pressed down that the dam can afterwards be used in most of the cases without annoyance. At your pleasure, you can remove the gutta-percha from the most favorable cavities, and see the relation that each and every cavity and tooth holds to its neighbor.

Imagine the superior cuspid decayed on its distal surface, with the first and second bicuspids on the anterior, distal, and grinding surfaces gone so far as to leave nothing standing but the buccal and palatal walls; and to this add yet the first molar with its anterior wall, crown, and distal surfaces as seriously involved. To fill such with gold would require the time of several sittings; but with amalgam the whole of it can be done in a short time at one sitting, and, unless the gums are weeping, without the rubber-dam. This latter is always in order if applicable at all. You can commence to fill at any one point. Should the separation be wide, then gutta-percha should be used as a matrix on one side only; or a roll or wad of bibulous paper will do; or punk or the napkin. Where the fingers can hold a piece on both sides, so much the better. I know of no steel matrix I would use, as true contour is not so possible, and you take extra risk of dislodging the alloy in removing the matrix. Besides, it is not so practicable to have a matrix that will cover all these spaces from the cuspid to the first molar.

As soon as the first piece of alloy is inserted a wad of bibulous paper (Japanese) as large as the cavity is placed thereon, and an oval-pointed steel instrument is pressed upon it with great force to crowd out the superabundant mercury. Go on adding alloy and more paper until the cavities are crowded full from cuspid to molar, leaving no intervening spaces. Direct pressure is not as efficacious as

rubbing the amalgam in with a burnisher over the paper, which drives the mercury out at all points. No rough-faced instrument should be used; smooth burnishers and oval-faced only, on the same principle as in rubbing in gold by the action of the mechanical mallet. When you have reached nearly the proper fullness, use the flatter burnishers entirely, to not only add the alloy, but to be sure that the mercury is carried to the edges. To do this, you must not lose a moment; and the alloy should not have too much gold in it, or you cannot undertake so much at one sitting. By the time you have gotten all the cavities full, you must commence at once to divide between each and contour.

It will be found that when the opposite teeth are made to antagonize with it, great care must be used to keep from dislodging any portion of this large mass; therefore, before the division on the approximal surfaces is made, see that the articulation is absolutely correct. Then, with a broach with small point turned, scratch away all the cervix until the tool reaches from both buccal and palatal surfaces, and the divisions are clear to nearly the grinding surface. Now, with a very thin knife or saw you can carefully divide the fillings to make each tooth distinct. In this proceeding great care must be exerted or the contour will be broken. When this has been done, shape with proper instruments, leaving all the grinding surface in contact as broadly as possible, so that, when the teeth go back again to their positions from which the gutta-percha had moved them, the food cannot wedge down between them. Where cavities are obscure on approximal surfaces, get the alloy as nearly in place as you can, and a wad of paper will be sure to force it down. Besides those cases with more or less walls for support, in those where much of the cusps of either wall is gone the alloy can be added and compressed easily and surely. Entire or partial crowns can be secured in a few minutes. Be sure that the alloy is not allowed to remain projecting over the free margin of the contour before the patient leaves. Then but little dressing of the contour is necessary when the operations are filed and finished.

Just here let me call your attention to the pointed fissure-bur for trimming around the cervix of all such cases. With it you cannot well inflict any pain, and you can be sure this frequent cause of irritability is removed. Never let the patient go without separating the fillings, or the act of mastication would destroy contour. It does not matter whether you use Japanese bibulous paper, cotton, punk, the napkin, or any medium whatever,—the *principle* of compressing the excess of mercury from amalgam after it is in the tooth is the advance which I claim. Paper or the napkin is best; punk is not tough enough.

Never use tin or gold foil for absorbing the free mercury. It only removes the surplus at the surface, and leaves the edges frail.

Silver, tin, and gold are all that are necessary to make a good amalgam. No platina nor zinc for me. From five to seven per cent. of gold will do. Beyond this it will set so quickly as to be unmanageable. It is better to have a surplus of mercury than not enough, provided it is worked out by bibulous paper.

If you must have a dry working alloy you cannot well have gold in it, as thorough amalgamation is uncertain. Alloys should be cut into the finest chips, that the whole mass shall amalgamate as quickly as possible. The mass should not be grainy, but as fine as velvet in feeling. Then, do not file amalgam.

I never weigh the mercury or the alloy. I pour mercury into my hand first, as much as I suppose to be half the size of the filling, and it is easy to guess at the amount of the alloy.

Now, as to the philosophy of the bibulous paper in compressing the amalgam. Will it press out any of the components with it, disproportionate to the mass, when first mixed? I say, most emphatically, no! I have watched it too long. What if it does? The result is above all consideration as to the exact proportion remaining.

It has been found that all metals are to a certain extent porous, and absorb gases; not on their surfaces, but in their bodies. One of the greatest advances in manufacturing steel is to compress it while in a heated state. Gold foil, if exposed long to the atmosphere, will absorb gases into its body, and when warmed you can see them pass off in a decided smoke of a color unmistakable. I have found amalgam without pressure porous, but not so when bibulous paper is used to drive off mercury. It has been suggested that the atomic proportions are secured by pressure. I am not as yet satisfied, further than that I know it does for amalgam what is done for steel and iron under pressure. It gives me results never before attained; and in my own practice gives me an advance that is only equaled by the discovery of cohesive gold.

The President. Gentlemen, what is your pleasure? We have heard Dr. Bonwill's interesting paper, and the subject is now before you for discussion.

Dr. Francis. I hope Dr. Bonwill will consent to demonstrate his method of packing amalgam before the discussion begins.

Dr. Bonwill. I have a steel matrix here in which I will pack some amalgam. This amalgam is composed of fifty parts silver, forty-three parts tin, and seven parts gold.

[Dr. Bonwill proceeded to mix the amalgam in his hand and pack

it into a steel matrix; making one plug with the use of bibulous paper, and another plug without its use.]

Discussion.

Dr. C. D. Cook. I would like to ask how the amalgams of to-day differ from, and in what respect they are better than, those made of filings from old Mexican or Spanish coin, which were used when I commenced practice? That was many years ago, and I have never ceased to use amalgam when I thought it the best filling for the cavity under consideration. When the gold furore was at its height I was perhaps somewhat influenced against the use of amalgam, but I never have abandoned it. I use gold also, both soft and cohesive; not Dr. Allport's soft gold, which he anneals before using, but soft gold to which I never apply heat. Those old silver amalgam fillings saved teeth. They sometimes became very black; they discolored to some extent teeth with living pulps, and when the pulps were dead the teeth became very black. I have noticed that amalgam fillings which come in contact with gold fillings in the same tooth turn black on the surface, but that they keep their position with less chemical or other change when in contact with a gold filling than when the same kind of amalgam is placed independently and alone in a cavity.

Dr. Francis. I was much interested in listening to Dr. Bonwill's paper, and particularly so when relating his experience with homeopathic physicians in efforts to combat their prejudices concerning amalgam fillings and rubber plates. I have had similar experiences myself. A lady came to me many years ago, showing much excitement, declaring that I had poisoned her daughter by putting amalgam fillings in her teeth. She stated that her child had been treated by her physician for a long time, but with no benefit whatever, and he finally decided that his failure was due to the presence of mercury in her teeth, which operated against his remedies, and counteracted their effect. I requested her to bring her daughter to me. She did so, and I examined her teeth, finding four or five gutta-percha stoppings, and two of tin-foil. No amalgam had been used, and I was almost sure of the fact previously. I was quite indignant to be thus charged with employing fillings affecting the child's health, and sent a sharp message to her physician in return. There is still much prejudice against the use of amalgam, and fears that the mercury will poison the patient or cause salivation. All this I consider absurd. My chief objection to amalgam as a stopping is that it is not always reliable. Although I have seen a great many such fillings which have been in the mouth for years, and done excellent service, I have seen others which in a comparatively brief period

have failed, the amalgam either receding from the cavity margins or the cavity margins decalcifying around the fillings. The causes of these failures are not always easily explained. To-day a lady requested me to fill a tooth with amalgam, and I did so. The cavity was on the posterior surface of a second bicuspid. In her teeth were a number of amalgam stoppings, and all doing good service. One in a superior cuspid was perfect in color, and caused no discoloration to the tooth. So far as the chemical effect of amalgam upon the system is concerned, I would not take it into consideration for a moment.

Dr. Brockway. There are amalgams and amalgams. A good amalgam properly used is, I believe, as reliable a filling-material for a large proportion of difficult cases as anything we have. So far as arresting decay is concerned, gutta-percha is doubtless the most effective of all materials; but of course its softness contraindicates its employment except in places little subject to wear. I speak of the *proper use* of amalgam, and this implies at least two important points that, so far as my observation goes, are frequently disregarded by many who employ it. The first is to prepare it with just as little mercury as will serve the purpose, and the second is to keep the completed filling dry until it becomes hard or until crystallization, so to speak, has taken place. If moisture be admitted to the filling while the thin edges—which may be present from any slight overlapping of the material—are still somewhat soft, the force of capillary attraction will cause the moisture to make its way around the whole mass, raising it slightly from the cavity, and of course destroying the perfect adaptation upon which so much depends. This source of danger was pointed out by Dr. Fletcher, of England, some ten years ago, but I do not remember having heard it alluded to in any discussion of the subject since that time; although to my mind it seems more clearly to account for the unfavorable condition of many amalgam fillings after a few months' service than any of the theories of expansion, contraction, or spheroidal tendency with which we have been so abundantly favored.

Dr. C. F. Ives. A few words concerning the quantity of mercury that Dr. Bonwill uses. I am well satisfied that there is less mercury in Fletcher's amalgam, where it is used dry, than in the plug which Dr. Bonwill has made here in the matrix. Certainly a third less mercury than he used would have made that plug; and the question with me is, do we want such a great proportion of mercury in our fillings? If he had used less mercury with the same amount of filings, would he not have had a greater proportion of metal in his finished filling? Is there not a greater quantity of mercury retained in the plug than if less were used, in spite of all the pressure of his bibulous paper.

Dr. Bonwill. If you will take the trouble to weigh these fillings, you can determine whether there is a greater quantity of mercury in them.

Dr. Ives. I am asking a question, not making an assertion. I believe, from my manipulation of amalgam, that I can make fillings with a third less mercury, and thereby have a larger proportion of filings.

Dr. Bonwill. I use five parts of mercury to six parts of alloy, and think you will find that Mr. Fletcher advocates the use of mercury in excess of the amount of alloy rather than a less quantity.

Dr. Ives. I am pleased to learn that Dr. Bonwill has a system by which he usually determines the proportion of his amalgam plugs. The filling just made possesses, I am sure, a larger proportion of mercury than five parts to six of filings.

Dr. J. W. Clowes. The great bugbear always attending amalgams is mercury! And yet mercury pure and simple, as a component of amalgam, is our very good friend, and incapable of harm. Do not fear to use enough of it in the preparation of fillings. Mix very soft, if you like, so that moderate pressure may send it to the minutest points. You must of course get rid of the excess, but that is an easy matter if you only know how! Dr. Bonwill has told us in long measure what can be done with amalgam, but even he apparently is unconscious of the limitless capacities his subject involves. Puttering with gutta-percha and temporizing with performance do not indicate the mental grasp that might appropriate the best at his command. Again and again I have declared before you that the possibilities of amalgam in dentistry are boundless! But gentlemen continue to talk about "spheroidal tendencies," "crumbling edges," and "renewals of decay," as though amalgam were responsible for any of these things. They stand, as it were, on the shore and busy themselves with refuse weeds and broken shells—all oblivious of the pearl of value within their reach and awaiting acceptance! It would be a measureless calamity should all dentists adopt the use of amalgam at once. Scarcely one in a hundred knows how to use it properly. There is but one way by which they can come to this knowledge, and that is through the skillful and saving manipulation of gold. They *must* enter by this door before they can comprehend the value and beneficence of amalgam.

Dr. V. H. Jackson. For several years I have used spunk, cut in small squares and strips of various sizes, for packing amalgam, and I like it better than bibulous paper. After compressing it against the filling usually with the pliers, a burnisher, or other instrument, the excess of mercury can be brushed away, and the filling often completed with the same piece. For compressing amalgam about a pin

in a root, or anchoring a crown, I cut the spunk into small strips, and while it can be easily placed where desired, it is not liable to be punctured by a fine instrument. However, I use a serrated plugger occasionally. In building up almost entire crowns of badly-decayed molars and bicuspids with amalgam, I make a band of German silver, fit it about the neck of the tooth, and solder it with soft solder. This can be done in three or four minutes, cutting it a little narrower than the height the crown is to be, and allowing it to remain for a day until the amalgam hardens. For septums, I use strips of German silver, and I am at present using the E. Parmly Brown strips. The idea was first suggested to me at the time the Herbst method was introduced. I pass the metal around the tooth to be inclosed, and fasten the ends by pressing them between some of the adjoining teeth; then fill and compress the amalgam with spunk. The filling can be so compressed that a tape can be drawn through without much fear of disturbing the contoured portion. I have found no method of clearing away the superfluous amalgam and smoothing the filling next to the gum equal to the use of linen tape and cotton pellets.

Dr. Francis. I would like to ask Dr. Bonwill why he uses bibulous paper in preference to spunk? I have used spunk for years in that manner, but not bibulous paper. Packing amalgam with bibulous paper is new to me. I intend to try it.

Dr. Bonwill. I think you will decide that bibulous paper is far better than spunk. You have the benefit of the long fibers of the Japanese paper, which is very desirable in packing around pins or screws in crown-setting, where there is but little space. I could not pack amalgam in such places with spunk, which I have often tried. You cannot put the pressure upon spunk that you can upon bibulous paper.

Dr. Dwinelle. I have used spunk in packing amalgam, but I have been careful to select a good article. Dr. Cook, of Brooklyn, has stated that he thinks the old amalgams were not much different from those we use now, and that he cannot see that the new are any better than the old. I am inclined to disagree with him in that opinion, for a variety of reasons. First, the old amalgam, which was made from old Spanish milled dollars filed up with a new file, contained more or less copper, an element which is almost sure to blacken the filling. Another bad element was the result of the use of a fresh file, which left considerable steel mixed with the silver, and which had a tendency to oxidize the entire mass. I think our modern amalgams made of alloys of different metals, and which are the result of many years' experience and much thought, are very much better than those formerly used. The old amalgams were

sure to turn very black, while some of our modern amalgams do not change their quality or color at all. I have seen amalgam fillings several years in use which were preferable to gold. They approximated nearer to the color of the teeth.

A word with reference to the tendency of amalgam fillings to blacken in consequence of coming in contact with gold or other metal fillings in the mouth. That depends upon a great many circumstances, some of which we are not able to define at present. I saw an amalgam filling in the mouth of a lady to-day that was exceptional in that respect. The tooth containing it was a lower molar, the front part of which was built up with gold over thirty years ago. About three years ago I found the back part of the tooth had decayed considerably, and the circumstances were such that I determined to fill the cavity with amalgam and have it come forward and join the gold. I had the pleasure of seeing it to-day, and the amalgam is nearer the color of the tooth than the gold is, and the gold has not changed color. We often come across combined fillings which are entirely unobjectionable in character. The lady just referred to told me she had never had a galvanic twinge, nor a suggestion of anything of the kind, in that tooth.

Our homeopathic friends naturally apprehend some constitutional ill effect from amalgam in the mouth, thinking also that it antidotes their remedies. I think the incident related by Dr. Francis fairly illustrates the fallacy of their theories in this respect, and that the objectionable qualities of amalgam exist only in their fancy, which fancies are of the *highest possible dilution.*

We know that all the metals will oxidize; even gold will oxidize to some extent, and the chippings or filings of alloy are particularly susceptible of oxidization. On that account I think that it is important that we should wash the amalgam. I use the ordinary washing soda for that purpose; and have sometimes washed away from one-quarter to a third of the substance of the amalgam.

In the early days of the profession there was an intense prejudice against amalgam, and it was carried to such an extent that some members of one of our early associations were ostracized and expelled because they used amalgam. One association went so far—I am ashamed to say, for I was a member of it, although not active in that direction—as to require each member to sign a pledge that under no circumstances whatever would he use amalgam, under pain of expulsion. Many men—to their credit be it stated—submitted to expulsion rather than be so restricted. It is a curious fact that some who in that early day were the most persistent in restricting dentists in this respect were men who, when driven into a corner by cross-questioning, confessed that "they had never used the 'dirty

stuff' at all," which shows how well qualified they were to judge of its merits. I have been in the habit of using amalgam through most of my professional life, and latterly perhaps more than ever; not because of advanced age, nor because I am growing lazy or indifferent to the welfare of my patients, but because I feel it to be the best under many circumstances. I have been as much a special advocate of gold as any one in my profession, yet I should hold myself in contempt if I refused to be governed by the evidence of my own senses. I use amalgam when I think it is necessary, in building up crowns and in other ways; but still I am loyal to my first love, gold.

I move, Mr. President, that a vote of thanks be extended to Dr. Bonwill for the very interesting paper that he has read here to-night, as well as for his demonstration and illustration.

We regret, however, that its great length gives us but little time to discuss it. His teachings were somewhat primary in their character, and we may not all agree with him, but we respect him for his honest declarations.

Dr. Dwinelle's motion was carried.

The President. The subject of the comparative value of amalgam with other filling-materials is a very interesting one, and it is to be regretted that we have not had a discussion of principles rather than of details. Amalgam has always seemed to me to be inherently an inexact filling-material, but I recognize the fact that it does nevertheless preserve teeth. Long ago the late Dr. T. B. Hitchcock demonstrated shrinkage in all the ordinary dental amalgams. Although some, to be exact, weigh the alloy and the mercury, the material don't stay where it is put; and for the most part proportions are guessed at, as we have seen Dr. Bonwill do; and if water gets in, the assumption is made that it can be pressed out again, so strongly is the idea held that a filling cannot preserve dentine without being moisture-tight. It seems to me very few amalgam fillings are tight, although no one can deny that they preserve teeth. I wish to thank Dr. Bonwill for giving the formula of his alloy, for I think the time has fully arrived for dentists to cease using secret preparations of any kind. The extensive use of compounds of which the ingredients are unknown is a great hindrance to progress.

Dr. Dwinelle. I do not like to dissent from the President, but nevertheless I do from his statement in reference to amalgam fillings shrinking. I have in the mouths of my patients amalgam fillings that have been in there for a long time. Many of them I have examined and tested in every possible way, and it is my best judgment after testing them that they have not shrunk at all. I think that a great many of the amalgams we now use do not shrink. I

had occasion to remove some of Dr. Clowes's amalgam fillings two or three years ago, and I am satisfied that they had not shrunk. They were as perfect as could be, and I was surprised to find the walls of the cavities as intact and unstained as though the teeth had been filled with gold. Nevertheless, I indorse the President in saying that we have not reduced to an exact science the making of amalgam fillings. It is variable, and probably will be so for some time to come.

Dr. Lord. I believe that in the very nature of the case all amalgam fillings will shrink. They may not appear to have shrunk when we examine them, but that they do is, I believe, admitted to be a scientific fact.

The President. I believe Dr. Lord is correct.

Dr. Dwinelle. Possibly that is the verdict of science; but if that is so I must oppose science in that particular, when I remove amalgam fillings and find they have not shrunk. I bow to science as much as any other man, but I must put faith in my own observations and experience.

The President. Does Dr. Dwinelle consider gutta-percha a tight filling?

Dr. Dwinelle. A comparatively tight filling,—yes. When I remove a gutta-percha filling and find the walls of the cavity have been hermetically sealed, as is frequently the case, I consider it a tight filling. There is nothing absolutely tight in this world. Philosophers are in doubt whether any two substances ever come in actual contact with each other. That is a very subtle question.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

Election of Officers.

The annual meeting of the society was held at the Academy of Medicine, No. 12 West Thirty-first street, Tuesday evening, December 13, 1887, when the following officers were elected for 1888:

President—J. Morgan Howe.
Vice-President—C. A. Woodward.
Recording Secretary—S. F. Howland.
Corresponding Secretary—C. F. Ives.
Treasurer—Charles Miller.
Editor—S. E. Davenport.
Executive Committee—E. A. Bogue, C. E. Francis, J. Bond Littig, S. G. Perry, and C. D. Cook.

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

The regular meeting of the Odontological Society of Pennsylvania was held Saturday evening, October 1, 1887, at the office of Dr. E. T. Darby, No. 1513 Walnut street, Philadelphia.

President Edward C. Kirk in the chair.

Incidents of Practice.

The treatment of alveolar abscess and also the several methods of devitalizing pulps were discussed.

Dr. Faught. Had I expected to speak upon the subject I should have brought an interesting tooth with me. It is a right inferior second molar. My attention was called to it by the lady patient applying for the purpose of having the fistulous opening in the gum healed. It was the first time I had operated for her. I applied the rubber-dam; removed the alloy filling in the crown cavity; found the pulp-chamber and canals empty; cleansed them; dressed with creasote, and stopped the cavity with gutta-percha. In using the probe in one of the canals, I found that it entered a perforation through which it passed to the outside of the root. I passed it through this false channel once or twice. To my surprise, upon seeing the patient a few days later, I observed unmistakable signs of arsenical poisoning on the gum around the tooth. Whence the arsenic? I had used none either in that case or even recently. Reflection convinced me that the arsenic must have been left under the old plug by the dentist who originally filled the tooth, and that I had unconsciously pushed it through the perforation into the gum-tissue. I extracted the tooth, and examination revealed a hole in the side of the root which had evidently been made by a spear-pointed drill.

Dr. James Truman. Arsenical applications should be carefully covered with gutta-percha. In case any arsenic touches the gum I would apply magnesia or ferric-hydrate or dialyzed iron immediately to the part affected. It is well-known that it has been impossible to devitalize with arsenic a pulp in a highly-inflamed condition without excessive pain to the patient. This fact has been one of the serious objections to the use of arsenic, and has had probably more to do with the adoption of capping than anything else. Dr. Kirk has partially succeeded in such cases by combining cocaïne with arsenic, but the uncertainty of the action of this agent in connection with the pulp renders it impossible to depend upon it. I have been for some time experimenting in the same direction, and have had most satisfactory results in the use of iodoform in small quantities in connection with arsenic. In all cases so far tried there has not been a particle of pain in acute pulpitis.

Dr. Darby. Much of the trouble arising from the use of arsenic is in consequence of the careless manner in which it is secured in the cavity. Sandarac varnish and cotton, in my opinion, is not the proper covering for an arsenical application. It should be sealed in with gutta-percha and wax, or with resin and wax melted and flowed upon it. I have seen some severe results in the hands of students and others who, in attempting to seal it in with sandarac and cotton, have forced the application out into the soft tissues. An interesting case of absorption of the root of a permanent central incisor recently came under my observation. It was in a mouth where all of the other teeth were present and of unusually good structure. The gentleman had never had a blow upon the tooth, nor had it ever given him pain. In color it was as white and apparently life-like as its fellow. When I saw it the root had entirely wasted away, leaving nothing but the enamel crown. I picked it off the gum with my thumb and finger, and immediately took an impression of the mouth, made a small gold plate, and mounted the natural crown on the plate. This was done by drilling into the crown and filling it with the phosphate of zinc, and cementing it to a gold post soldered to the plate.

Partial paralysis of the face may sometimes attend an operation. A few months ago, when filling the canal of a lower first bicuspid, previous to putting my gutta-percha cone into the canal I wiped it out with dilute carbolic acid. As soon as the probe carrying the cotton had passed down the canal, the patient put her hand to her face and remarked that it had lost all sensation. I completed the operation, but the paralysis continued for four or five days. There was undoubtedly an unusually large foramen at the apex of the root, and some of the carbolic acid had gone through, and coming in contact with the nerve supplying the other teeth and adjacent tissues, had caused this trouble. I have known similar results to attend the use of chloride of zinc.

Dr. Kirk. In the devitalization of pulps I do not use the arsenical preparation in the condition of paste, but take a minute portion of cotton, rolled into a pellet, into which I force the paste with a spatula until it is thoroughly incorporated with the cotton, avoiding an excess of the paste. The prepared pellet is then appropriately sealed in the cavity in contact with the pulp. This method of making the arsenical application obviates any risk of arsenical ulceration of the surrounding tissues, as there is no excess, and the arsenic is securely retained by being incorporated with the cotton fibers. In regard to the arsenical preparation, I have found no difficulty in devitalizing pulps, even those which are inflamed, since I have adopted the use of cocaïne in connection with the arsenious

acid. I am still using the preparation of which I published the formula some time ago in the DENTAL COSMOS, composed of 20 grains arsenious acid, 20 grains of cocaïne hydrochlorate, 5 grains menthol crystals, and sufficient glycerin to make it into a very stiff paste or putty.

With regard to the use of carbolic acid upon the orange-wood stick in the heroic or immediate method of pulp-extirpation, alluded to by Dr. Bennett, I would suggest that it is of value by reason of its well-known local anesthetic properties, which would have an obtundent effect upon the stump of pulp-tissue, and avert a recurrence of pain, after the benumbing effect of the shock from the operation had passed away.

Adjourned.

The regular meeting of the society was held Saturday evening, November 5, 1887, at the office of Dr. Littleton, No. 1225 Walnut street.

President Kirk in the chair.

Henry Leffmann, M.D., D.D.S., professor of chemistry and metallurgy in the Pennsylvania College of Dental Surgery, read the following paper:

SOME NOTES ON DENTAL ANTISEPSIS: ITS POSSIBILITIES AND IMPOSSIBILITIES.

The subject of dental caries has been a matter of careful but highly unsatisfactory study for many years. Dr. Black, in his elaborate article on this topic, in the lately issued "American System of Dentistry," gives an interesting sketch of the growth of our knowledge of the cause of this disease. Of the thousand and one lesions to which the animal frame is liable, very few indeed present the peculiarities seen in the decay of the teeth. The pain and inconvenience are out of all proportion to the magnitude and activity of the tissues involved, and the diseased action occurring in an exposed situation is yet or has been until recently unexplained. In the study of this topic the assistance of microscopy and chemistry was, of course, early invoked, and by their aid some general principles were established, which, however, may have contributed in part to obscure the true scientific solution. It was learned, for instance, that micro-organisms are always present in and around a carious tooth, and that it is acid. Yet it was scarcely to be supposed that these organisms are the cause, for they existed under all conditions, and the acidity might be the effect rather than the cause of the diseased state. The past ten years has witnessed a remarkable development in the

methods of studying minute life, and although a knowledge of the general principles of this modern bacterial pathology is widely spread, yet there is much misunderstanding as to the exact details, upon which a proper appreciation of the practical results depends. Even the learned workers in this field at first failed to grasp clearly all the points, and it has only been lately that the chemical changes brought about by bacterial life have been recognized as important factors in its effects. When, as in the case of the bacillus of anthrax, or of tuberculosis, it was demonstrated that these forms stood in an undoubted causative relation to the diseases with which they were associated, attempts were made to explain their action on mechanical principles; they were supposed to block up the nutrient vessels or to act as local irritants. Long before the functions of micro-organisms in the ordinary processes of decay were demonstrated, chemists had begun to recognize in these actions the formation of a class of substances which, although produced in minute amount, were of distinct chemical and physiological properties. Experiment showed that, in the early stages of putrefactive change, bodies analogous to the so-called alkaloids, and called "ptomaines," were formed, but the method of formation was not traced and the chemical composition not determined. We owe to Brieger, a German chemist, much of the exact information on this matter. He first, by careful analysis, secured the isolation and identification of these products. It is still, to a great extent, a matter of speculation as to how these products are formed. In many cases they are the excreta of the microbes; in other cases they are the result of the splitting up of more complex substances or coalescing of simpler bodies by the disturbance of the molecular state of the compounds caused by the growth of the micro-organism. Some of these actions have been recognized and studied with much accuracy. Thus, the yeast-plant, the fungus of vinegar, and that of the viscous fermentation, have all been recognized by their distinct actions. It is possible to secure specific changes in organic solutions by sowing pure cultures of certain forms. Brieger has lately, for instance, succeeded in producing a definite alkaloid, tetanine, by developing a pure culture of the bacillus, which is the cause of idiopathic tetanus, and this alkaloid is capable of producing the typical symptoms of tetanus.

The multitude of forms and the wide distribution of microscopic life is known to all. It is by no means limited to processes of decay or disease. Within the past year or two many experiments have been made upon water and air, and have shown that in the purest attainable specimens of these large numbers are present, and that they appear to increase even in the almost entire absence of organic food. Although it does not belong to this subject, yet I may

mention that an English government commission has recently published the result of some very carefully conducted investigations into the microbes present in air under various circumstances, and has shown that sewer air is one of the purest forms so far as freedom from micro-organisms is concerned.

A certain number of the microscopic forms give rise in their development to bodies belonging to the class generally known as acids. This term is so much misunderstood that I feel obliged to say a word or two about the significance of it. Acids, according to our modern chemistry, are always hydrogen compounds. Hydrogen is a gaseous element, and, judging by analogy, it should be of rather weak affinity; and such is actually the case. It is more easily driven out of compounds than the other elements of its group. In those hydrogen compounds which we call acids we have some of the most easily decomposed bodies of the class, and any substance which is prone to change is, other things being equal, an active compound. We notice the closest similarity in type between, for instance, oil of vitriol and plaster of Paris; both are sulphates, and have the same arrangement of atoms. In oil of vitriol we have, however, hydrogen, an element easily driven out of combination; the compound which contains it is prone to change, and hence an active chemical substance. In the calcium sulphate, on the other hand, we have a much more permanent and powerful play of affinities within the molecules; hence more stability and less chemical activity.

Let us see, now, what are the conclusions from these general principles.

The teeth are organized structures of rather low vital activity. They are continually bathed in a fluid which, though not constant in composition even in the same individual, is practically always a culture medium,—that is, contains the elements and is at the temperature necessary for the growth and development of micro-organisms. The microscope shows that many forms are always present. And when our methods of chemical analysis become more precise, there will no doubt be found a complex mixture of products—ptomaines—as a result of this bacillar growth. If this action were limited to the productions of neutral or basic organic principles, there would probably be a much simpler oral pathology than there is. It so happens that among the products of this organic growth, these unstable hydrogen compounds, acids, are largely formed, and it is from these, owing to their more energetic effect, that a different story is told.

The teeth are susceptible to the action of acids, and sooner or later must yield to the influence of the bodies so developed. It was at one time believed by many that the acidity of the fluids surrounding

the teeth was due to the saliva. It is not necessary to go over the evidence which locates the main cause of the acidity in connection with certain developments in the microscopic life in and around the gums. The whole question will be found ably discussed in the paper of Dr. Black, before referred to. We start in this essay with the assumption that all these points are admitted. The bacilli produce, either by their catalytic action or as excreta, a certain amount of acid which acts destructively on the tooth-substance, and as a result of such injury degenerative changes occur. The practical problem is how to prevent and put a stop to such actions. Now, a cure of any disease does not necessarily depend upon a knowledge of the cause of it. Medical men have for centuries been curing malarial fever without having even the most remote idea of its cause. So, also, in the treatment of dental caries, as well as in its prevention, considerable progress was made with only speculative views as to its cause. When, in the last few years, the bacillar theory of its origin developed there were no doubt many enthusiastic minds which assumed that the problem of its prevention and cure was solved. The obvious remedy against bacteria is a disinfectant, and accordingly we have of late years heard much of the dental uses of the disinfectants and their congeners.

It is for the purpose of calling this question into discussion that I have asked for some of the time of this society for some notes on the practicability of this method of treating the teeth. That we may start fair, let me take up a few moments in defining some of the terms which I will have occasion to use.

Antiseptic is a term applied to bodies which arrest putrefactive change, while a germicide is an agent which actually kills all forms of microscopic life. The growth and development of microbes are, of course, processes of nutrition, and they may be prevented from growing by depriving them of the necessary nourishment, just as well as by actually making war upon them with poison. The so-called antiseptics often act in this manner,—that is, they render the food unavailable, and thus starve out the micro-organism. Continued experimenting with the beings, however, has taught us that they are very tenacious of life, and that they possess to a high degree that power of remaining quiescent which is often seen in the simpler forms of life. Further, they may in some cases be comparatively easily killed when in the adult condition, but produce minute spores in great abundance, which are far more resisting. So different, indeed, is the resisting power of the spore and the adult microbe, that we might almost divide germicides into two classes, germicides proper and sporicides, the former being those agents which act destructively only on the developed microbe and

not on the spores. I have above referred to the production of various alkaloidal principles during the growth of micro-organisms. Among those so produced are sometimes some of the very substances which have the power of destroying the producing organisms, and thus these beings put an end to their own existence. This is precisely analogous to what we see in the higher plants and animals. They produce those bodies which are most injurious to their life. The animal, for instance, produces carbonic acid, and the plant produces oxygen. It is not surprising, therefore, that some of the microbes actually produce germicides. The particular substances are germicides, because they are the excreta of the germs, which are poisonous to them just as the excreta of an animal would be poisonous to it. I have here an interesting body called naphthylamine, and closely allied to naphthaline, which is now one of the antiseptics in fashion. It has a distinct odor, not very powerful, but strongly recalling that of a carious tooth. I have sometimes thought that this may be more than a mere coincidence. This body may actually be produced in tooth-decay. In the concentrated form in which we have it here it is rather pungent, and its resemblance in odor to carious tissue is noticed much more markedly when diffused in small quantity through the air. If actually formed in tooth-decay, it would be a germicide.

The microbe principally instrumental in dental caries is anærobic,—that is, can live without access of oxygen. It can therefore flourish in the recesses of tooth-structure, and its development will not be prevented by simply covering it. By its growth and development it produces acids which act upon the structure of the tooth. Whatever of other neutral substances are formed do not come into prominence, because they are not the cause of any diseased process. In the mouth we have a very favorable condition for active microbic existence,—warmth, air, albuminoid matter, and phosphates. Some of the forms are ærobic,—that is, require air for their growth; while others are anærobic,—that is, developed best out of contact of air. These latter find in the cavities of the teeth a chance to exist

Starting, then, with these modern notions of the pathology and our knowledge of the effective germicides, we have to inquire how far these may be used for preventing the ravages of the microbes in the mouth. The last few years have witnessed a remarkable increase in the number and availability of the agents, and scarcely a month passes without some real or apparent addition to the list. Far more important, however, is the fact that our method of investigation into the value of a disinfectant has become much more scientific and exact. In fact, we may be said not to have had any method for this investigation ten years ago. The use of the modern culture

methods has enabled bacteriologists to determine under what conditions these bodies live or perish.

These observations, however, require great skill, and many of the conclusions which have been reached are rendered valueless by the defective methods. Further, business competition and the desire for publicity in connection with scientific work have led to extravagant claims being made for certain remedies. Many substances are credited with being germicides when in reality they are only at best inhibitory,—that is, delay the growth and multiplication of germs, but do not devitalize them, and when the germs are removed from the influence of the chemical substances they resume their activity.

The practical issue is brought out by the suggestion which has been made of antiseptic tooth-washes and antiseptic tooth-powders. For the purpose of making the discussion less abstract, I have brought with me a few of the modern so-called antiseptics. We have here naphthaline, salol, iodol, and thymol. Here is one of the most recent, saccharine, the sugar substitute, which is now said to be an excellent antiseptic, and to be entirely harmless.

I think there is great reason to doubt if any of these bodies are in the true meaning of the term germicides or antiseptics in the degree of concentration in which they are used. Doubtless still fewer will be found to be sporicides. Their action is inhibitory only; they prevent germ-development only when they are actually present. Some years ago Mr. Winter Blythe, of England, showed that was true even of some of the more powerful and recognized agents, and still more must it be true of those of feebler intensity. Several formulæ for antiseptic tooth-washes have been offered as fufilling the indications here referred to, and, with a view of testing the practical value of these, I made up two forms and present them for consideration by the members. In my opinion, they are both rather too strong, and can only be used very much diluted with water. This will of course interfere greatly with their antiseptic effect. Besides this, they are necessarily retained in the mouth for a very short period, and even if we suppose that they penetrate to all parts and supportive structures, they do not remain long enough to do any good. I give herewith the two formulæ, both of which I have used, and find the first the most agreeable:

Thymol	4 grains.
Benzoic acid	45 "
Eucalyptol	220 "
Alcohol	3 fluidounces.
Oil of wintergreen	25 drops.

Use a teaspoonful in about three tablespoonfuls of water as a wash.

Thymol	20 grains.
Alcohol	1 fluidounce.
Glycerin	1 "
Water	Enough to make one pint.

Use as above.

We may further inquire in this connection whether there is anything in the modern discoveries which is opposed to the usual methods, and I think we may find a positive advance. The microbic theory of dental caries compels us to modify our views as to many of the formulæ used for dentifrices and mouth-washes. We know that one of the most favorable conditions for development of microbes is a mass of slowly-decomposing organic tissue especially associated with mineral matter containing phosphates. The introduction, therefore, into the crevices between the teeth of fragments of food constitutes one of the best soils for this development. I think, also, that with tooth-powders we do the same thing. The modern doctrine is opposed to all formulæ for these powders in which an insoluble animal or vegetable powder enters, and the more complex the formula is the more objectionable it is. Our efforts ought to be directed to preparing a mixture which shall consist of a feebly alkaline and not very insoluble mineral base, with a proportion of that germicide which is a most efficient destroyer of germs, and least harmful to the tissues with which it comes in contact. I do not know that we have as yet sufficient data to enable us to meet these indications. As an effort in this direction, I have here some substitutes for dentifrices, using magnesium carbonate for chalk,—a substitution which I favor because it is softer and forms more soluble compounds than chalk. I propose the entire omission of all powdered vegetable matter, such as orris-root and cinchona-bark; also, cuttle-fish bone or other gritty matter. With the magnesium carbonate is incorporated as much of some one of the organic antiseptics as can be borne. If a perfume is needed, oil of wintergreen seems the best.

[Specimens of powders made with magnesium carbonate and eucalyptol, beta-naphthol, etc., were shown.]

From these considerations we must decide, I think, in regard to dental antiseptics, that while it is perhaps possible to resort to them with advantage in a cavity which may be charged with the material and allowed to remain so as to get the continuous action, yet no practical benefit will result from the transient and superficial use of solutions or powders, which are at best but inhibitory in their action on germs; further, that while we have no trustworthy data from which to prepare a true antiseptic dentifrice, yet we may be sure that none of the older formulæ are in accordance with the indications which the modern discoveries suggest. Many of these formulæ

include substances which produce conditions favorable to the development of microbic life.

These, then, are the theoretical inferences which I feel inclined to draw. It remains for the members of the society to determine how far practical and clinical experience confirms or upsets these views.

Discussion.

President Kirk. We will be pleased to hear from Dr. Sudduth on the subject.

Dr. W. Xavier Sudduth. This is a subject to which I have given much thought during the past few years, and one of vital interest to the dental profession. Oral antisepsis is the most prominent question before dentists at the present time. We know well enough how to fill teeth, but what is most needed now is to know how to prevent decay in the first instance, and how to preserve the teeth we have been called upon to fill. While I am willing and glad to accord to Dr. Miller all the praise he deserves for his discoveries regarding the action of micro-organisms in caries, yet I do not want to see the dental profession run away after "bugs," as germs have sometimes been facetiously called. I presume I am as well acquainted with Dr. Miller and his ideas regarding decay as any man in America, having worked in his laboratory; and I know that he has never written or said a great many things which have been attributed to him. That micro-organisms play an important part in decay no one can gainsay, but that they are the *all-important* factor I do most strenuously deny. In the first place, unless there is a faulty development to begin with, a sulcus which is not well closed, or a fracture or fissure, or badly-crowded teeth, decay as a rule will never attack a tooth. But when any one of the above conditions is present, then micro-organisms find entrance and hasten the process; they are always present in the latter stages of decay, and are an important factor. I have never been able to frame a better sentence expressing the order and causes of decay than the one I remember having heard Dr. Flagg give when sitting under his teaching in 1879, viz: "Mechanico-chemico vital action, with its parasitic concomitants." I would, however, make quite a different application of the *vital* part of the question than did Dr. Flagg at that time. The fluids of the mouth in health are alkaline or neutral, but when, in consequence of constitutional derangement or a diseased condition of the mucous membrane located on the tongue, cheeks, inside of the lips, or on the gums at the cervical margin of the teeth, the secretions of the mouth or of any portion of the mucous membrane which comes in contact with the teeth become acid, a condition favorable to decay is produced. That micro-organisms developing

in the mouth also tend to produce an acid condition there can be no doubt, and in so far as this occurs they are potent factors in helping to destroy the teeth; but, as is well known, when teeth are well attended to or stand isolated, decay is of rare occurrence; as a rule, it is only when some predisposing condition such as has already been indicated exists that decay develops.

The most common micro-organism found in the mouth is the leptothrix buccalis. We have never been able to cultivate it, and consequently know very little about its connection with decay. What most interests us as a profession is how to preserve teeth after we have been called upon to treat and fill them. The failure of fillings at the cervical margins I consider is in many instances due to the granulation tissue developed in that position by reason of the irritation to the soft tissues by poorly-finished fillings. It is a fairly well-established fact that such granulation tissue produces lactic acid, which, coming in contact with the tooth-substance, produces decay. This may be seen best in cases of fungous or luxuriant growths of granulation tissue, the result of misfitting plates or clasps. Here the teeth may be found to be very sensitive at the point where the tissue comes in contact with the tooth. The acid secreted in such cases is probably lactic, a very little of which goes a very long way in producing decay. Dr. Miller brought out a point in regard to its action a year ago last summer, and that was that it would not be satisfied with carbonate of lime. After making a saturated solution of calcium carbonate in lactic acid, pieces of dentine placed in it were still decalcified. Decay is the result of acid disintegration of tooth-substance; antiseptic treatment in the mouth consists in keeping the fluids of the mouth neutral at all times. Now, this can be accomplished in various ways, as many causes conspire to produce an acid condition; so we must be conversant with each and every cause, and direct our energies toward their removal. Where micro-organisms are concerned, use germicides; where diseased conditions of the mouth exist, treat the local conditions; where constitutional derangement is present, direct your attention to building up your patient's general health; where misfitting plates, or clasps, or roughly finished fillings are at fault, smooth off the sharp corners and cauterize the unhealthy granulations. In a word, keep a perfect hygienic condition in the mouth at all times, and decay will be less frequent, fillings will last longer, and your reputation will be enhanced.

Dr. James Truman. The assertion of Dr. Sudduth that granulation tissue at the gingival border and a diseased condition of the mucous membrane were two prominent causes of caries, seems to me to require examination. He acknowledges that the breaking down of the cervical border is a result of chemical disintegration, and hence

must be the action of an acid. From whence this acid? Are we to accept the position that micro-organisms have nothing to do with its formation? To assert this seems to me to be in direct opposition to known facts. If the conclusions of the best observers are to be received as authority, then it is questionable whether caries can be produced at all in the oral cavity without their aid. My own judgment is that they are the principal primary causes, and it is to their waste products that we must look for the degeneration of tooth-substance. The exhaustive experiments, as far as carried, of Dr. Miller to my mind settles this question beyond cavil; but had these never been made, I would still have entertained the same view, based on my own very imperfect work done some years ago.

I cannot agree with the speaker in the assertion that the normal condition of the secretions of the mouth is alkaline. Such has not been my experience in a lengthened period of testing oral fluids. The neutral character of the secretions is surprisingly constant, and it was the persistence of this result that led me to an investigation of the fluids during prolonged periods of rest, and which demonstrated the fact that there is a marked change from neutral to acid at night. The inference drawn from this was that the destruction of tooth-tissue is mainly produced during the hours of sleep. Up to this time remarkable difference had not been noticed, though Dr. Miller has since called attention to it.

It is certainly true, as Dr. Sudduth has stated, that the mouth is an extensive culture-place for micro-organisms. That it is a good one is evidenced by the fact of the great variety there produced. Clinically, we certainly know that the best protector of tooth-structure is antisepsis, and under this head we ought to class thorough cleanliness. To insinuate that germicides are of but little account, seems to me to be putting us back many years.

We are all aware that the work during recent years of such men as Leber and Rottenstein, Miller, Underwood and Mills, Black, and many others, has led up to the fact that many, possibly all, microbes are acid-producers. It is impossible to exclude leptothrix buccalis, although it has not as yet been demonstrated as one of these. The great number of these organisms found in cavities leads to the inference that, if not acid-producers, they at least aid in destruction by contact, as fibers of cotton will do if held in cavities and saturated with the fluids of the mouth.

I was greatly pleased with Dr. Leffmann's paper. We need more and more to understand the true value of these agents, and this can be accomplished only by a better comprehension of the relation which microbes bear to most diseases of the oral cavity, and that before general treatment can be made effectual these low forms of

life must be destroyed or their active work inhibited. Many of the antiseptic preparations presented to-night are comparatively new. That recently introduced, hydronaphthol, a derivative from naphthaline, has been criticized as not being a germicide. I am not prepared to say at present whether it is or not; but such is the claim made for it, and certainly, in a clinical sense, it operates most satisfactorily. I have seen nothing to change my opinion of this agent expressed before this society last winter.

A vote of thanks, offered by Dr. Darby, having been adopted, Dr. Leffmann, in acknowledging the same, said, "I would like the society not to forget to discuss the question of the usefulness of the various forms of dentifrices."

Dr. Kingsbury. The subject of antisepsis in its relation to dental practice obviously implies the consideration and discussion of dental caries; its true pathological nature and etiology, and its most successful treatment with antiseptic remedies. This view opens up to us a broad domain for thought and investigation. It has led to the most assiduous and patient research in histological studies and chemical experiments, to obtain a correct knowledge of the minute structure and various constituents of the hard tissues of the human teeth.

Caries of the teeth is an evil so wide-spread and so serious in its consequences that we need not fear of giving to it too much attention and study. The fact of its having been the subject of investigation and controversy among dentists, physicians, and scientists for almost a century furnishes no ground for any abatement of interest on our part. The subject is by no means exhausted.

Whatever light may have been thrown on it, whatever progress may have been made,—and surely no one well informed on the subject can for a moment doubt that great progress has been made since the time of that close observer, John Hunter, of England,—there yet remains work to be done. Ours is preëminently an age of progress. We have incentives and facilities for successful investigations in general science and medicine, and especially in dental pathology and practice, which our predecessors in the same fields of labor did not possess. We have reason, therefore, to hope that, if it be within the scope of human possibilities,—and I fully believe it is,—all that is obscure and doubtful, all that seems now intangible and evasive of demonstration, will be made clear as the sunlight, when fanciful speculations will give place to solid facts, and the perplexing problem of dental caries, as to its causation and *modus operandi*, will receive a satisfactory solution.

Doubtless you are all acquainted with the fact that the theory of Bell and Fox was that of inflammation. But they differed as to the

seat of the inflammation. Mr. Fox located it in the pulp-membrane, while Mr. Bell believed that inflammation of the dentine immediately under the enamel was the cause of the caries. Koecker entertained the same opinion, with the addition of an intimation that possibly chemical agency might be involved in the putrefactive process. These views were evidently mixed with error, and radically defective. I think Mr. Tomes came much nearer the truth when he conceived and promulgated the chemico-vital theory. He believed that caries of the teeth was mainly due to the presence and agency of a free acid within the cavity of the tooth, which acted as a solvent of the lime-salts, and that certain vital phenomena were involved in the carious process while the pulp possessed vitality.

Mr. Tomes had many disciples, and I confess that for many years I was one of them. I had so much faith in the correctness of his theory and reasoning, that I have felt no small degree of reluctance in yielding to other views. But recent researches and developments made by Mills and Underwood, of London, and more recently and fully, by Drs. Koch and Miller, of Germany, may win me over to what is now known as the septic theory of dental caries. This theory is based upon the alleged discovery and agency of various forms of micro-organisms or parasites, which are ever present in greater or less number in the oral cavity, floating in its saliva, exploring all its recesses, filling the interstices between the teeth, crowding into and finding a safe harbor in every pit and cavity in the teeth, large and small.

It is claimed that, of the various species of micro-organisms, the bacteria and leptothrix buccalis are those most concerned as factors in the decay of the teeth; as parasites, fungi, or plants somewhat analogous to the yeast-plant, possessing the power of producing a fermentative process and secreting free lactic acid, which acts as a solvent upon the lime-salts and dentinal fibrils, thus carrying on its ruinous process to completion unless arrested by remedial treatment.

Such are in brief some of the salient points of the new theory of dental caries. A comparison of this theory of the process of decay with that entertained and taught in our dental colleges during the past twenty-five years will, I think, lead to the conclusion that the remedial treatment applicable and successful in one would be equally so in the other, for the obvious reason that the active agent of decay in both cases is the same,—namely, a corrosive acid; and "antisepsis" in its relation to the teeth is of equal importance, as antiseptic treatment is indicated alike under the old and new theory of decay.

Dr. Jas. Truman. There is one part of Dr. Leffmann's paper that I overlooked in my previous remarks, and which seems to me of some importance,—that of combining many ingredients in tooth-powders.

In the older formulæ we find the manufacturer beginning with a base, and then apparently adding everything without much regard to possible antagonisms. This, in my judgment, is not the proper way to treat conditions found in the mouth; nor is it the right way to prepare a prophylactic. Our ideas should be definite as to the end to be attained, and we should then make use of the agent or agents best adapted to accomplish this. An astringent is not indicated in a mouth perfectly free from congestion; but an antiseptic may be, to prevent active development of micro-organisms. An antacid may not be required, and again it may be the one essential thing to use. Each case must be judged for and by itself, for few mouths present the same conditions, nor are these alike at all hours in the twenty-four. Tooth-powders may or may not be of value, and are often, I think, a positive injury, producing slight gingivitis and opening the door to more extended lesions. The hour is too late to discuss the subject of dentifrices, and hence I simply give these as suggestions and germane to the subject under discussion.

Dr. Tees. For thirty years I have daily used a powder containing *many* ingredients (prepared chalk, orris-root, borax, Peruvian bark, bicarbonate of soda, Castile soap, sugar, salt, and rose pink). I do not doubt the usefulness of any of these except the coloring matter, and even that probably assists in removing the secretions. My children have used this powder since babyhood, and I think they have as nice teeth as any children in this city. We have been told by the scientists present that the micro-organisms produce acidity, and that destroys the teeth. The antacids in tooth-powders will neutralize this, and in a measure prevent injurious effects. When my patients ask my opinion in regard to dentifrices, I advise the use of powders and supply them with what I use myself. I prefer prepared chalk as an antacid ingredient in tooth-powders. This is the genuine precipitated chalk. That sold by druggists as *creta præcip.* is not chalk at all; it is precipitated carbonate of lime.

Dr. Kirk. The subject of caries of the teeth is one that involves so many factors and conditions that it seems almost without limits; but several points in its etiology seem to be well established,—namely, that acids produce disintegration of tooth-substance; that wherever caries exists can be found the microbes or micro-organisms described by Miller and others; that these micro-organisms elaborate an acid which has the power to disintegrate tooth-structure and dissolve its lime-salts. While I recognize the importance and value of Dr. Miller's discoveries, it still seems to me that there are other and equally active conditions concerned in the production of caries. Thus, tooth-structure is readily attacked by almost any acid which may find its way into or be produced within the oral cavity, without the

agency of micro-organisms. For instance, the ingestion of acid food may have a direct action upon the teeth, when allowed to remain in contact with them for even a short time. I believe the fermentation of certain organic food substances may result in the production of acids without the introduction of micro-organisms.

Dr. Truman. What causes the fermentation?

Dr. Kirk. I should have said decomposition where I used the word fermentation. It is perfectly possible, for instance, to convert alcohol into acetic acid by direct oxidation, without the aid of a ferment; and it seems perfectly possible to my mind, in analogous changes during the putrefactive processes which food débris in the mouth undergoes, to have acids developed which may aid in the carious process. To call attention to one of the factors in the production of caries, I will relate a case: A gentleman presented for treatment whose first and second upper molars, left side, had been widely cut apart by the disk some two or three years previously. The impaction of food in the space had caused much irritation; and to relieve this I inserted large contour fillings of amalgam in the approximal cavities, bringing them in contact, and closing the space. A year later, perhaps, he returned with increased trouble of an inflammatory character in the region of the septum between these teeth; pus had formed which showed signs of pointing upon the buccal aspect of the ridge over the position of the septum. He stated that there had been a periodical discharge from the necks of the teeth for some time. The teeth contained vital pulps. After evacuating the pus-cavity with a lancet, an exploration with the probe revealed a loose fragment of bone occupying the space formed by the trifurcation of the roots of the sixth-year molar. The tooth was at once removed, together with the sequestrum of dead bone. At the cervical portion of the amalgam filling, and extending up to the trifurcation of the distal, buccal, and palatal roots, was a deeply-eroded cavity or gutter, the result of the solvent action of the ichorous discharge which had constantly taken place at that point for months.

I speak of this case as it suggests to my mind a possible explanation of that phase of caries which we observe frequently at the gum-margins of teeth.

Dr. Leffmann's reference to the strangulation of micro-organisms by their own excreta, and the anærobic character of others, no doubt explains why it is that decay does not progress in those cases where the pulp is almost invaded, and we leave a portion of carious tissue as a protective covering to that organ; clinical experience having demonstrated that, where an air- and moisture-tight filling is inserted, caries does not proceed in a tooth so treated, though the carious dentine

which is left must undoubtedly contain myriads of microbes. With regard to antiseptic mouth-washes,—I am not certain that it is possible to use as a mouth-wash any antiseptic of sufficient strength to act as a true germicide which might not at the same time have an injurious effect upon the tissues of the mouth or teeth. This, of course, does not apply to their local use in the treatment of pulpless teeth or pyorrhea alveolaris. As to tooth-powders, I regard them as valuable chiefly for their detersive and antacid characteristics. I do not consider the Gatling-gun quality of many of the mixtures used as tooth-powders as at all desirable. We have in simple precipitated carbonate of lime all that is required in a dentifrice, except perhaps the addition of a pleasant flavor. It certainly meets all the requirements. Magnesium carbonate has much the same qualities. It is perhaps a little softer and more soluble.

Perfect cleanliness is the best of all prophylactics in the prevention of caries. It is much easier to exclude germs than to evict or destroy them when they have once found a lodgment. The best recoveries it is said in abdominal surgery are those where the Listerian spray has been dispensed with, and absolute cleanliness is depended upon to prevent the intrusion of germs.

Dr. Guilford. One point associated with the subject of the essay has not been touched upon. The essayist discussed the presence of bacteria in the oral cavity, and the part they played in the production of caries. But what part do they play in the formation of alveolar abscess? Are they always chargeable with its formation? This is a question upon which the members of the medical profession are at variance.

When a tooth-pulp becomes devitalized from any other cause than caries, as from a fall or blow, we may have an abscess as the result, although quite as often we do not. When abscess does not at once result, the tooth will usually remain for years without any active pathological condition manifesting itself. Should, however, the pulp-chamber be opened into and air be admitted, unless antiseptic treatment be at once resorted to, we will have alveolar abscess as an immediate sequence. Is not this caused by bacteria being conveyed there by and from the air? Under these circumstances what is the best antiseptic and germicide to use? For years we have been using carbolic acid and bichloride of mercury for the treatment or prevention of abscess, and more recently iodoform has yielded us good results. With the latter I have had exceptionally favorable results in the treatment of active abscess.

For twenty years or more, before the germ theory of disease had gained any special publicity, many of us had been in the habit of wiping out all cavities with carbolic acid or creasote before filling.

This was not done to prevent the recurrence of caries, but to render the tooth more comfortable. In so doing may we not have been building better than we knew, for the germicidal character of carbolic acid has since been fully established and taken advantage of in surgery.

As the essayist and others have remarked this evening, cleanliness is our best prevention of disease. A Scotch surgeon has performed a hundred and fifty operations of abdominal surgery without septic results by the simple use of distilled water in a spray. He thus accomplished without an antiseptic as good or better results than are usually obtained with one. This should emphasize with us the importance of cleanliness in the care of the teeth. One of my earliest recollections is of a neighbor who after each meal would go into his yard with a dipper full of water and rinse and cleanse his teeth and mouth most vigorously. He lived to be over seventy, and was never known to have exchanged a single dollar for dental services.

In the use of dentifrices the principal benefit we derive is from their abrasive effect. In cases where the acidity of the secretions is to be guarded against, we receive most benefit from the application to the teeth and gums before retiring of some positive alkali, as the precipitated carbonate of lime. It will act as a sentinel to ward off evil influences during the night when the parts are in a state of repose.

Dr. Sudduth. I fully agree with what Dr. Kirk and Prof. Guilford said in regard to the beneficial action of distilled water in surgery, and also in regard to perfect cleanliness as a prophylactic measure in treating wounds. But the speakers must not forget that both are parts of antiseptic treatment. It is not always necessary to wait until the germs are actually present in a wound before you begin antiseptic treatment; if you can prevent their ingress so much the better. The use of distilled water in surgery is considered fairly good practice, but not equal to bichloride (1-2000), which not only cleanses the surface but destroys any germs that may have fallen upon the wound. If there is no real benefit to be derived by antiseptic treatment, I would ask why take the precaution to use distilled water? In so doing they are virtually admitting the efficiency of antisepsis; for by distilling the water it has been rendered free from germs, and when used only acts as a mechanical agent in removing superficial germs. In a vast majority of surgical operations of the present day no after treatment or dressing is employed; the surfaces are thoroughly cleansed before the operation with soap and water, final precaution being taken to rinse them off with bichloride. The instruments are kept in the same solution while the operation is

being performed; the sides of the wounds are brought in apposition and securely stitched together; a dry dressing of iodoform gause is laid over, and not disturbed unless the patient shows symptoms of septic poisoning, until healing occurs.

The highest antiseptic surgery consists in preventing the entrance of the germs; following this, to destroy them if possible after they have found their ingress. An antiseptic remedy is not necessarily a germicide, although it is generally best to employ the latter, provided it has no deleterious action upon the tissues. We may prevent the development of germs by destroying the conditions favorable to their growth; but the safest antisepsis lies in destroying the germs themselves.

Dr. Register. I would bring to the notice of the gentlemen present an antiseptic and germicide not mentioned by the essayist,—namely, hot air. With me this method is considerable of a hobby, having given much attention to its numerous uses in dental practice. My method for treating a cavity preparatory to filling is, during the process of excavation, to throw into it—either cold or heated to about blood heat, up to a point as hot as can be tolerated—compressed air until the dentine is more or less desiccated. This lessens the sensitiveness very much, and while in this dry condition a filling is placed in closer contact with the walls of the cavity than in the ordinary way of practice. Although moisture again surrounds the filling after discontinuing the desiccating process, it comes *from within through the circulation*, and if there be *no* foreign matter in the immediate border of the basis-substance, *a zone of secondary dentine* is built around the filling in a short space of time. This is shown by the thermal influence, which, being more intense at first, is of short duration, and experiment has shown secondary dentine to form several lines deep. Dr. Guilford called your attention to the condition of teeth which have devitalized putrescent pulps, and which as a rule gave trouble after being opened to atmospheric influences. The cause of this has been explained,—*bacterial impregnation!* If, immediately upon exposing the degenerate tissue, the atomizer is used, and the parts are sluiced through a good opening, and the tooth be kept perfectly dry thereafter by compressed air, heated to say 120° Fahrenheit, or as hot as the patient can bear it, then the canals can be immediately filled, *permanently*, with any desirable agent, or *not filled at all*; the filling simply bridging the bulbous portion of the canal at the bifurcation.

If we will call to mind the condition of the mouths we have treated,—even those of the best class of people,—we will admit that they are not, as a rule, kept clean; and we know that perfect cleanliness is necessary to prevent decay. You can examine a mouth

after the most careful cleaning with the tooth-brush, and in the interstices between the teeth and crevices and abrasions of the enamel particles of food and other matter that a brush can never reach will be found, and wherever found it is possible for them to cause decay. Now, in connection with the brush should be used the atomizer, which will throw water with considerable force upon and between the teeth, and most of the environment with its bacterial life will be removed. In other words, sluice the mouth by atomization, and place an alkali in the liquid for general use, and an antiseptic in that for cases indicating its use, and the mouth can be kept in an approximately clean condition. Fuller's earth (hydrate of aluminum) as a dentifrice has the quality of becoming soft in the mouth; it will remove all débris from the teeth, and is also antacid.

My experience with pulpless teeth is sufficient to teach me that they can be so treated that there will be no fear of trouble afterward. I have had but two cases of after-trouble since I began using the compressed air systematically several years since.

Dr. Leffmann, in closing the discussion, said: I have been much pleased at the interest which has been taken in this paper, and if it has been of benefit to anyone I am very well satisfied. So far as the question of germ action affects dentistry, I think there can be no doubt that the modern views are substantially correct. That many diseased processes are caused or propagated by germs, must be regarded as established. Every day adds proofs to this view, and adds to the number of those who so believe. Among the affections which are characterized by the invariable presence of specific microorganisms, to which they stand in an undoubtedly causative relation, are anthrax and tuberculosis, and I think we may now add caries of the teeth. There are other diseases concerning which a microbic origin is inferred, but in which this remains to be demonstrated. Modern antiseptic surgery has been often pointed out as a proof of the truth of these theories, but I think we may still admit that much of its results are due to the routine cleanliness which it enforces. The gentleman to whom Dr. Guilford alluded, who thoroughly washed out his mouth after every meal, followed the natural method of antisepsis; and so with some surgeons, such as Mr. Tait, who scouts the antiseptic methods in his field, but who by his extreme care and cleanliness gets the best results, and is after all regarded as one of the prominent exponents of the general truth of the germ theory. One method of antisepsis is to prevent any germs getting in or remaining when they do get in; the other is to kill them with germicides. With many operators, the routine cleanliness required by the first method would not be carried out to the proper degree; but if certain formulæ and solutions are prescribed

there is a likelihood that they will be used, and thus the result will be obtained. For instance, very few persons would persistently carry out the method to which Dr. Guilford alluded, but most persons will use a mouth-wash, especially if it has a rather unusual taste, and thus the cleansing effect will be obtained, although the germicidal action is *nil.*

In regard to the question of the non-saturation of lactic acid, as mentioned by Dr. Sudduth, from observations by Dr. Miller, of Berlin, I must of course hesitate to attempt to explain an action which, as I understand, has puzzled the chemists of that city; yet I may say that lactic acid is a peculiar acid, and so is phosphoric, and that, after the acid had formed all the calcium lactate which it was capable of forming, it might react with tooth-structure, which is not entirely composed of calcium compounds. We know that some of the phosphates—*e. g.*, sodium phosphate—may be destitute of any admixture of free alkali, and yet in contact with oils they will have an emulsifying quality much as dilute alkali would have.

In the experiments by Dr. Miller the calcium lactate might react with the magnesium phosphate of the tooth, and thus a slight corrosion would be produced.

AMBLER TEES, D.D.S.,
Recording Secretary.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

THE First District Dental Society of the State of New York held a regular monthly meeting, Tuesday evening, December 6, 1887, in the rooms of The S. S. White Dental Manufacturing Co., Broadway and Thirty-second street.

The president, Dr. W. W. Walker, in the chair.

Dr. C. S. W. Baldwin, of the Clinic Committee, read the following report:

CLINIC REPORT.

There were eighty dentists at the clinic to-day, all vying with each other in seeing and presenting new appliances and unusual cases. . . . B. A. R. Ottolengui, M.D.S., of New York, filled a tooth with Williams's new crystalline gold. In finishing, the doctor used a new disk having a fiber of chamois on its working surface, which holds the powder applied for polishing. A patient was present for whom Dr. Ottolengui had transplanted a bicuspid in an enlarged socket eight days before. He held the tooth in place by a vulcanite splint, reaching to the gums and covering the cuspid and three posterior teeth. This splint, fitting loosely, held a dressing of cotton saturated with Pond's extract, and was removed by the patient before each

meal. The tooth was firm. The doctor thinks teeth become firm in much less time by this treatment than without a splint. . . . Dr. H. H. Sisson, of New York, exhibited an ingenious crescent-shaped disk-sheath, which allows the disk to come in contact with the tooth or filling, and at the same time protects the cheek or gum and prevents the disk from catching the rubber-dam. The sheath is made in two pieces, covering most of the disk. Dr. Sisson also showed a very simple form of nitrous-oxide blowpipe, made by soldering another pipe at the middle of an ordinary blowpipe coming back parallel to the first. Pieces of brass were soldered over the large ends of the pipes, and afterwards pierced by the smallest drills. Nitrous oxide and illuminating gas united through these pipes produce a very intense flame. . . . Dr. G. Evans demonstrated with a pulp-canal drier, which consisted of a copper bulb and silver needle attached to a steel handle. The copper bulb being heated, conducts it to the needle, which, placed in the canal, dries it effectually. . . . Dr. J. A. Kimball showed his non-separable disk-holder. . . . Dr. E. T. Starr, of Philadelphia, had some pure palladium which, mixed with equal parts of mercury, formed an amalgam for filling purposes. Those who have used this material claim that it neither contracts nor expands. In the mouth it becomes very hard and black, like copper amalgam. Dr. Starr says Drs. Bogue and Lord, who saw it in Europe, where it is used quite commonly, think it a perfect plastic filling. . . . Dr. Parker, of Brooklyn, recently removed a filling that had been in place five years. The walls of the cavity being thin, were slightly discolored. The doctor said, "I literally had to bore out every particle of the filling, it adhered to the wall so firmly. The other fillings in the same mouth presented a remarkably beautiful appearance." . . . Dr. Starr exhibited some solid gold crowns made to unite with the seamless collars. They were very true to nature, but it is thought they must be rather expensive. We understand that these as well as the palladium may be found at the S. S. White Co.'s depots. . . . Dr. W. I. Thayer, of Brooklyn, displayed a very complete cocaïne case, made by Parke, Davis & Co. . . . Dr. V. H. Jackson, of New York, was present with the patient who had had a supernumerary tooth extracted, and whose case he reported at the October meeting, the report of which appeared in the December number of the DENTAL COSMOS. There is evidence that the alveolus is absorbed, and that the lateral is returning to its former irregular position. A variety of opinions were expressed as to the best method of further treatment. Dr. Atkinson advised allowing it to remain as it is so long as it will. Dr. E. Parmly Brown thought best to extract the lateral and bring the cuspid to its place, cutting the point to the lateral's shape. . . . Dr. Mitchell, of Bergen Point,

N. J., showed a preparation of bichloride of mercury in the form of tablets, one of which, placed in a pint of water, makes a solution of one to a thousand.

Dr. Atkinson added to the report of the Clinic Committee the following remarks:

Mr. President and Brethren: I suppose the object of our meeting, and of what was presented at the clinic, is to get a grip of the principles involved so as to enable us to improve in practice. The great difficulty with us is a lack of knowledge of first principles which would entitle us to a judgment of what we see. I want to speak particularly as to the difference of opinion between Dr. Brown and myself with regard to the replanted tooth that was spoken of. The occlusion is as perfect as can be on both sides; and the moving of the cuspid now in contact with the lateral—the extraction of which Dr. Brown advises—would break up the entire occlusion on that side, and involve a great deal of inconvenience and difficulty. I hold that, wherever a patient is beyond the complete development of the twelfth-year molars, it is bad policy to break up a good occlusion for almost any reason. I know of no reason that would justify an anatomist, a physiologist, or a pathologist in advising such a proceeding.

Dr. Kingsley. Say it stronger.

Dr. Atkinson. "Say it stronger," Dr. Kingsley says. I am glad to have a man of his experience say "say it stronger," because he has the knowledge to entitle him to an opinion in the matter. Another point with regard to the absorption in that case: We know very little about resorption in replanted or implanted teeth. It is a field in which we are hardly entitled to an opinion. We are simply feeling our way to get, if possible, a knowledge of the conditions that exist. This tooth was treated aseptically, and has done well, so far as my superficial examination enables me to determine. I put my fingers inside and outside, and I found that the alveolar plate, to my perception, was in a very favorable condition; and although the tooth has turned out of the position in which it was inserted, and returned a little to the original malposition, I have such confidence in Dr. Jackson that I would defer to his judgment, and would advise him to let it remain for a time. I have never known an adult tooth which had once begun to absorb that spontaneously stopped the absorption. I have known several cases where they have been taken out and sterilized and replaced, and the absorption has been arrested.

Dr. B. A. R. Ottolengui. Mr. President: As there seems to be an interest in the subject of replantation and implantation, I would like to say a few words in regard to the case that was exhibited this

afternoon at the clinic. I have here a model of the case showing the splint that was used in position, and I would like to explain how it is made. You will observe that the central incisor has a Logan crown; and this lady came to me to have another crown placed on the bicuspid root. That root was poor, and I proposed that it be extracted and another tooth inserted in its place. It was a first bicuspid, and I thought it would be difficult to tie the tooth in place, and it occurred to me to fasten it without ligatures. Before I extracted the root I filled up the space between these teeth with gutta-percha; then took an impression with the gutta-percha in place. I then pressed the tooth into the gutta-percha, and took another impression with the tooth I was going to use apparently in position. After scraping away the composition from around the gum, quite a little hollow space was left. When the tooth was put in, and the vulcanite splint adjusted, there was a space left for the retention of the dressing. I have put in several of these teeth, and have not yet had a failure. The best I have ever done before was to get a firm attachment in four weeks. In this case the tooth was perfectly solid and tight in eight days. It is now two weeks since it was implanted, and there is no trouble whatever.

The President introduced Dr. W. Irving Thayer, of Brooklyn, N. Y., who read a paper the subject of which was "Faith."

[The reading of Dr. Thayer's essay, with the discussion on it which followed, occupied the balance of the evening, but our space will not permit the publication of either the paper or the discussion.—Ed. Dental Cosmos.]

Adjourned.

B. C. Nash, D.D.S., *Secretary.*

ST. LOUIS DENTAL SOCIETY.

The St. Louis Dental Society held its annual meeting Tuesday evening, January 3, 1888, and elected the following officers for the ensuing year:

Henry Fisher, president; J. Warren Wick, vice-president; Wm. Conrad, corresponding secretary; J. H. Spalding, recording secretary; A. J. Prosser, treasurer; A. H. Fuller, W. H. Eames, and G. A. Bowman, publication committee; J. B. Newby, Geo. P. Holmes, and W. N. Morrison, committee on elections and ethics.

Wm. Conrad, *Cor. Secretary,*
Hotel Beers, St. Louis, Mo.

WASHINGTON CITY DENTAL SOCIETY.

The Washington City Dental Society held its annual meeting at Washington, D. C., December 20, 1887.

The following officers were elected: H. B. Noble, Jr., president; R. H. Gunnell, vice-president; William Donnally, secretary; R. B. Donaldson, treasurer; Garnett Hills, essayist.

William Donnally, *Secretary*,
No. 1321 F street, Washington, D. C.

MISSISSIPPI VALLEY ASSOCIATION OF DENTAL SURGEONS.

The forty-fourth annual meeting of the Mississippi Valley Association of Dental Surgeons will be held in Cincinnati, Ohio, on the first Wednesday in March (7th), 1888.

A large attendance is assured.

C. M. Wright, *Chairman Ex. Com.*,
266 West Seventh St., Cincinnati, O.

MARYLAND STATE DENTAL ASSOCIATION.

The fifth annual meeting of the Maryland State Dental Association will be held in the Dental Infirmary of the University of Maryland, Greene street above Lombard, Baltimore, on February 16, 1888, at 8 o'clock P. M.

Wm. A. Mills, *Secretary*,
No. 122 South Broadway, Baltimore, Md.

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA CLINIC.

The regular Clinic of the Odontological Society of Pennsylvania will be held at the depot of The S. S. White Dental Mfg. Co., Twelfth and Chestnut streets, Philadelphia, on Saturday, February 4, 1888, at 2.30 P. M.

Dr. H. A. Parr, of New York, will demonstrate his method of crown and bridge-work; and Dr. W. X. Sudduth, of Philadelphia, will exhibit original histological work in dental embryology.

Members of the profession are cordially invited to be present.

Daniel Neall McQuillen, D.D.S.,
Chairman Clinic Committee.

BIBLIOGRAPHICAL.

TRANSACTIONS OF THE ODONTOLOGICAL SOCIETY OF PENNSYLVANIA, 1884–1885.

The transactions for 1884–5 of this comparatively young but vigorous and growing society make up an octavo volume of 156 pages. Besides the several essays and discussions on current dental subjects, it contains lists of officers, the constitution and code of dental ethics of the society, a list of members, and an index. We believe copies may be obtained by addressing Dr. Ambler Tees, No. 548 North Seventeenth street, Philadelphia.

PAMPHLETS RECEIVED.

Wisdom Teeth. By J. D. Thomas, D.D.S., Philadelphia, Pa.

The Inconsistency of our Code of Dental Ethics. By Dr. C. H. Land. Detroit, Mich., 1887.

The Legal Status of Dentists. By Daniel Nason, Esq., New York. Read before the Dental Society of New York, at Albany, May, 1887. Rochester: "Odontographic Journal."

Proceedings of the Twelfth Annual Session of the Mississippi State Dental Association, for the year 1887, held at Meridian, Miss., May 17, 18, and 19. Meridian, Miss.: E. E. Spinks, 1887.

Transactions of the American Dental Association, at the Twenty-seventh Annual Session, held at Niagara Falls, N. Y., commencing on the 2d of August, 1887. Philadelphia: The S. S. White Dental Manufacturing Co., 1887.

Dental-Kalender für Deutschland, 1888. I Jahrgang, Theil I. Breslau: Redaction des Dental-Kalenders für Deutschland, Königsstrasse 1. Commissions-Verlag von S. Schottlaender. Theil II: Lists of Dentists in Germany, Dental Journals, and Dental Colleges. Received from Dr. Erich Richter.

OBITUARY.

THOMAS WARDLE, M.D., D.D.S.

DIED, in Philadelphia, December 5, 1887, of general debility, Dr. THOMAS WARDLE, in the sixty-ninth year of his age.

Dr. Wardle was born in Leicester, England, in 1819. He graduated in medicine in this country in 1853, and was elected professor of mechanical dentistry and metallurgy in the Philadelphia Dental College at its organization in 1863, which position he occupied during five sessions.

Dr. Wardle was esteemed as an honorable, conscientious man, and enjoyed the confidence of his patrons for a long term of years.

THE

DENTAL COSMOS.

VOL. XXX. PHILADELPHIA, MARCH, 1888. No. 3.

ORIGINAL COMMUNICATIONS.

CONTRIBUTIONS TO THE KNOWLEDGE OF TUMORS OF THE JAWS.

BY CARL HEITZMANN, M.D., AND FRANK ABBOTT, M.D.

(Read at the Nineteenth Anniversary of the First District Dental Society of the State of New York, January 17, 1888.)

MODERN histologists agree that the animal body is composed of only four varieties of tissues,—viz., connective, muscle, nerve, and epithelial. All attempts at basing a nomenclature of tumors on strictly anatomical or histological grounds must be in agreement with this division of the normal tissues. In fact, there is not a single morbid growth to be found which does not have a representation in some physiological tissue. Among the four varieties, it is only the connective that carries blood and lymph-vessels. Muscle-fibers and epithelia are destitute of vessels, they being supplied with nourishment by the surrounding and subjacent layers of connective tissue, or rather the vessels therein contained.

The nerve-fibers are surrounded by vascularized connective tissue, while the gray substance of the nerve-centers is considerably mixed with it, although a satisfactory distinction between the gray substance and this tissue—the so-called neuroglia—has never been made. The normal connective tissue in its perfect development appears in four varieties,—viz., the myxomatous, the fibrous, the cartilaginous, and the osseous. In accord with this subdivison, we find a number of varieties of tumors which are composed entirely of a myxomatous, fibrous, cartilaginous, or bony tissue, being termed myxoma, fibroma, chondroma, and osteoma. These are the representatives of a type of tumors known clinically as benign, since they grow very slowly, do not cause pain, do not ulcerate except after local injuries, and do not produce secondary tumors in internal organs, and even after many years' growth never cause death directly.

Fat-tissue is a sub-variety of myxomatous, and tumors largely composed of such tissue are termed lipoma. If blood or lymph-

vessels are largely prevailing in a tumor, it is called vascular, or angioma. If muscles enter the structure of the tumor we speak of it as a myoma, and if nerve-fibers are present in great numbers the designation is neuroma.

In all these instances more or less fibrous connective tissue (the carrier of blood-vessels) enters into the architecture of the tumor, and even in certain varieties of angioma, the so-called cavernous—the fibrous connective tissue bounding the caverns filled with venous blood—carry, as a rule, capillary blood-vessels. According to the prevailing structure present, we will designate a given tumor as a myo-fibroma if the muscle-tissue predominates, or fibro-myoma if the fibrous connective tissue is in excess over the muscle-tissue. Here again we have four typical varieties of tumors, which we call benign from a clinical point of view.

The unripe or embryonal condition of all forms of connective tissue is termed indifferent or medullary. Tumors that are built up of such tissue belong, as Virchow has shown many years ago, to the group of connective-tissue tumors, for which he proposed the term sarcoma. These grow rapidly, causing more or less pain and sometimes ulceration, besides being very prone to excite the formation of secondary tumors in internal organs, thus directly leading to the death of the patient. Clinically they are known as malignant tumors. Since the term would indicate a fleshy tumor, we propose to abandon the name sarcoma and substitute for it the word myeloma, which really designates what the tumor is composed of, viz., medullary tissue.

It is impossible to tell why myeloma should possess deleterious properties, which enables it to transform all sorts of tissues and organs into its own peculiar structure. Neither do we understand the reason why myeloma appears mainly in children and young persons, in contradistinction to carcinoma, which is, in the great majority of cases, a disease of advanced life. The main constituents of myeloma are gobular or spindle-shaped corpuscles, with very little intervening basis-substance. This feature furnishes the most important point for a differential diagnosis between the benign and malignant forms of tumors of the connective-tissue series. There are, however, transitional forms in which portions of the new growth are well supplied with basis-substance of any of the four above-named types; whereas other portions are composed mainly of medullary tissue. It also occurs that we meet in the middle of a benign tumor with nests of medullary corpuscles, usually in the neighborhood of the sources of nutrition,—*i. e.*, around the blood-vessels.

In compliance with our nomenclature, we shall designate tumors of such a mixed character as myxo-myeloma, fibro-myeloma, chondro-

myeloma, and osteo-myeloma. Combinations like these always mean a tumor growing rapidly, being prone to recur after operations not skillfully performed, and gradually to assume the characteristic features of purely malignant myeloma. In such cases attempts at eradication, such as cauterization and injuries of any nature, hasten the transformation of a slightly into a markedly malignant growth.

The fourth group of tissues, the epithelium, never produces a tumor alone, since it is invariably combined with more or less vascularized connective tissue. If the latter produces papillary elevations, covered on the outer surface with stratified epithelium, we term it a warty growth, or papilloma. If the epithelium produces acinous or tubular prolongations into the depth of the connective tissue, we have a glandular tumor, or adenoma. Both of these types are clinically benign; whereas the third type, in which epithelial and connective tissue are intermixed without any regularity, is designated cancer, or carcinoma, being decidedly malignant. Again we are unable to say wherein rests this pronounced capacity of carcinoma to infect all sorts of neighboring tissues, more especially the adjacent lymph-ganglia, and to transform normal tissues into its own.

Quite recently, however, Scheürlen, of Würtemberg, Germany, has demonstrated bacilli of a characteristic form and growth, which he claims are the elements which cause cancer. Schill, of Dresden, claims priority of this discovery, maintaining at the same time that bacilli similar to those of cancer are also to be found in sarcoma or myeloma. This discovery is too novel to admit of its immediate and unqualified acceptance, although there are good clinical reasons for the assumption that specific germs may be present in either of these diseases.

One large group of tumors is represented by closed cavities filled with liquid or semi-solid contents, the so-called cysts. Such growths arise mainly in organs which, in a physiological condition, contain epithelial or glandular structures. In many instances a new formation of glandular tissue (an adenoma) precedes the appearance of a cyst. Closed cavities, however, are not infrequently found in both benign and malignant types of connective-tissue tumors, and in such cases we are in the dark as to the origin of cysts, designating the new formation cysto-fibroma, cysto-osteoma, cysto-myeloma, etc.

As to the cause of tumors, we wish to allude to the theory of the late Cohnheim, which suggests misplaced embryonal germs. This brilliant theory was by himself subsequently limited to certain varieties, such as primary cancer in the bone or in lymph ganglia. Unfortunately, however, this theory cannot be proven, either by direct observation or by experiments upon animals. We are positive

of only one fact, viz., that an acute traumatism or oft-repeated slight injuries—in short, a local irritation—furnish in many instances the issue for the appearance of abnormal growths. In several of our specimens the trace of a previous traumatism was found under the microscope, in the shape of clusters of pigment, the result of a hemorrhage that must have occurred long before. Inflammation of the gum and the pericementum are acknowledged to be fertile sources of tumors, as well as traumatisms or other irritations.

Our observations are based upon seventeen different tumors. These embrace the most common types of both benign and malignant tumors of the jaws. The great majority were primary on the jaws, and only two cases, one of myeloma and one of carcinoma, are secondary to the jaws by contiguity. We exclude from our consideration all tumors of the teeth proper.

I.—Myxoma.

This variety of tumor is not rare on the gums around the teeth. The specimen under observation is the size of a robin's-egg, with a nodulated surface, originally of a blood-red color, of rather soft consistence, and grown upon the gum of the lower jaw, left side between the second bicuspid and first molar. It occurred at every pregnancy, for the third time, in the mouth of a lady aged about twenty-six years. Tumors had been removed from the same locality four different times, when the patient was a girl from twelve to fourteen years of age.

With low powers of the microscope the raspberry or papillary appearance was well marked upon the surface, as represented in Fig. 1. The surface is coated with a single row of columnar epithelium, which is bounded toward the subjacent connective tissue without distinctness,—so much so that the lowest portions of columnar epithelia and the bodies wedged in between them blend with the adjacent layers of medullary tissue. The so-called structureless layer can be made out in but few places. The main mass of the growth consists of an extremely delicate net-work of fibrous connective tissue with interspersed nuclei mainly at the points of intersection. The meshes of this net-work contain as a rule only one medullary corpuscle; but near the surface such corpuscles are present in large numbers, to such an extent that the reticulum is rendered invisible. The corpuscles are comparatively small and nearly compact near the periphery, while they are granular and markedly larger in the deeper portions. The outermost portions of the tumor, owing to the abundance of medullary corpuscles, have the character of a myeloma; but the gradual appearance of a myxomatous basis-substance in the deeper portions proves that the tissue is myxomatous, and the

clusters of the medullary corpuscles merely signify a rapid growth at the surface.

FIG. 1.

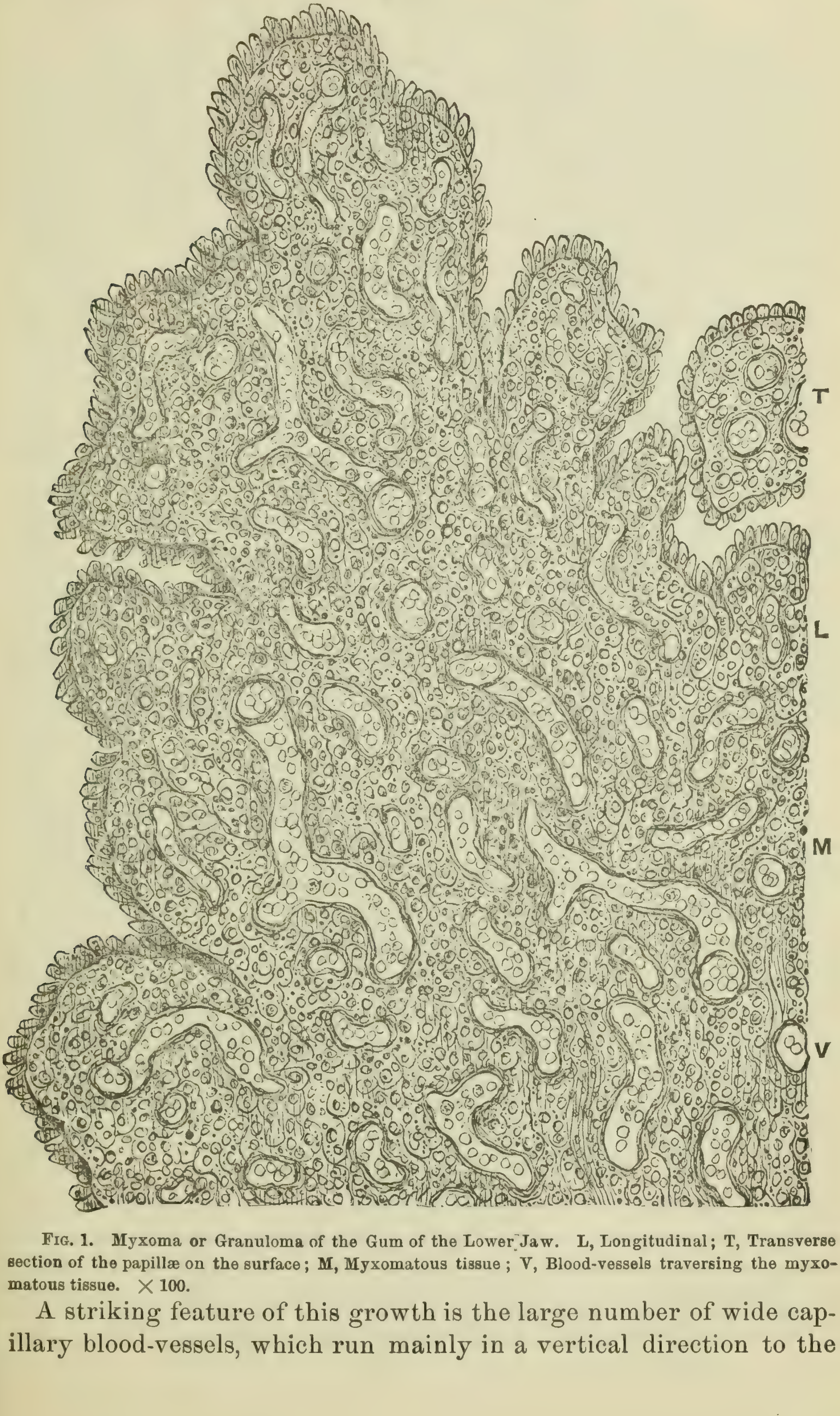


FIG. 1. Myxoma or Granuloma of the Gum of the Lower Jaw. L, Longitudinal; T, Transverse section of the papillæ on the surface; M, Myxomatous tissue; V, Blood-vessels traversing the myxomatous tissue. × 100.

A striking feature of this growth is the large number of wide capillary blood-vessels, which run mainly in a vertical direction to the

surface, and therefore appear in transverse sections where the papillæ are cut transversely. The arrangement of the capillaries in a tassel-like manner seems to account for the papillary or nodular architecture of the surface. The so-called proud-flesh or granulation tissue of suppurating wounds has the same structure as the tumor under consideration, and some authors speak of a granuloma corresponding to the structure of a myxoma, but being a product of an inflammatory process. In the deeper portions of the tumor delicate bundles of fibrous connective tissue are visible, and most of the vessels are accompanied by tracts of such tissue, by which an adventitial coat is produced, even around the capillaries, which is not visible in normal tissue. In the deepest portions the fibrous connective tissue is rather abundant, the medullary corpuscles being at the same time scanty, and the blood-vessels bearing the character of veins.

Growths of this kind are sometimes seen arising from the gum between the teeth, owing to some constant irritation. It is quite possible that the lady in whose mouth the tumor grew irritated her gums, perhaps mechanically, by allowing particles of food or tartar to accumulate. The microscope does not enable us to draw sharp boundary lines between products of inflammation and tumors proper. Good authorities—for instance, Virchow—claim that a tubercle or a gumma due to syphilis is a tumor composed of granulation tissue, and is therefore granulomata, whereas most modern writers agree that the nodules mentioned are caused by inflammation.

II.—Myxo-Fibroma.

This variety of benign tumors is likewise known as occurring frequently, taking issue both from the gums and the periosteum. Its consistence is harder than that of a pure myxoma, and softer than that of a pure fibroma. (See Fig. 2.)

The illustration is taken from the deepest portions of the myxoma above described. It consists of interlacing bundles of a delicate fibrous connective tissue, exhibiting therefore an indistinct reticular arrangement. The meshes between the bundles are filled with a finely-granular basis-substance, in which medullary corpuscles are stored up in varying numbers. The blood-vessels are comparatively scanty, consisting of capillaries and veins, all of which are surrounded by a distinct layer of fibrous connective tissue. The endothelia of the capillaries are unusually large and bulging toward the caliber. In some places the capillary appears to be surrounded by two or more endothelial layers, which add considerably to the thickness of the vascular wall. The specimen affords a good opportunity for the study of the manner in which, first, myxomatous arises from

medullary, and fibrous from myxomatous tissue, a process which, as is well known, is of frequent occurrence in the history of develop-

FIG. 2.

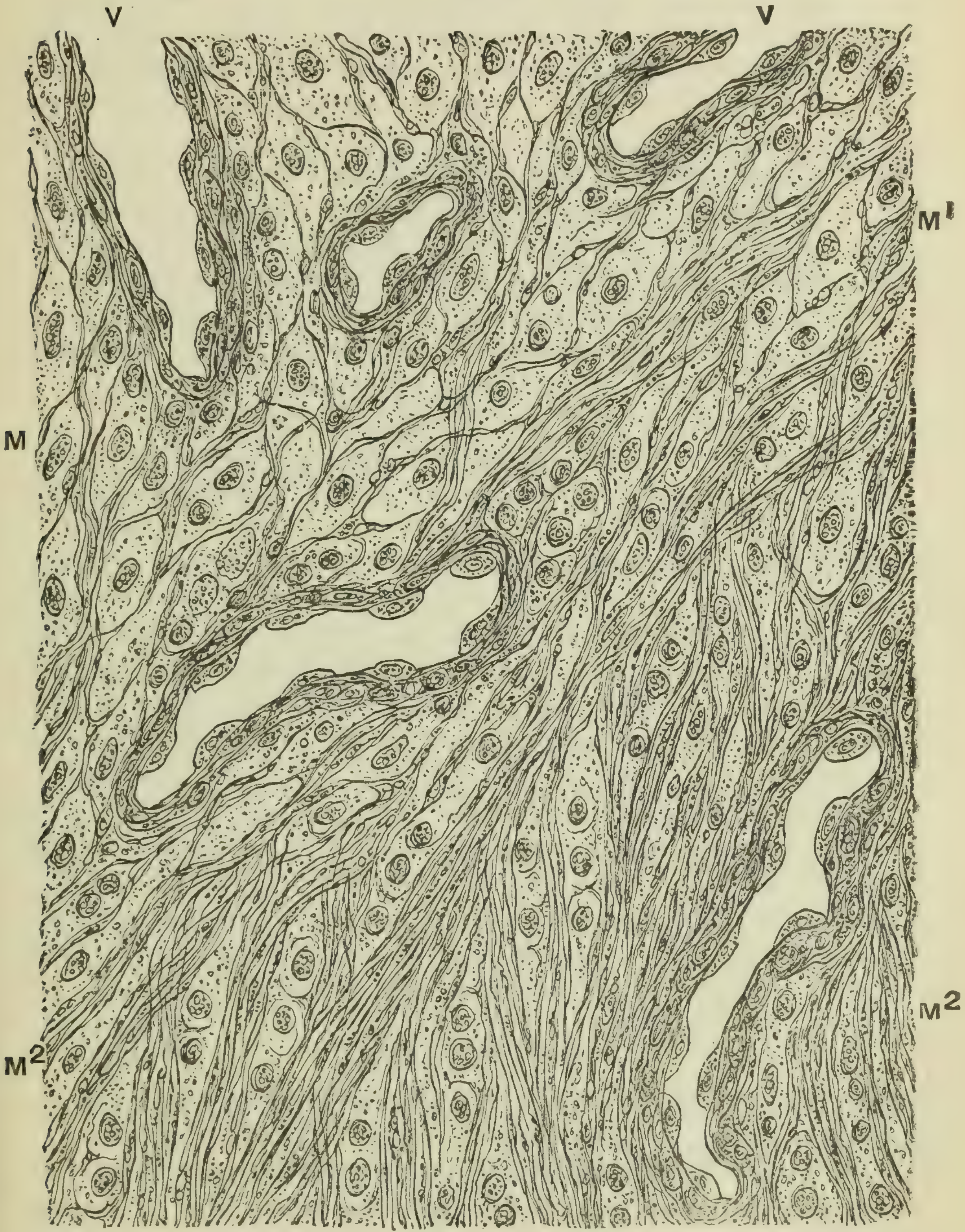


FIG. 2. Myxo-Fibroma of the Gum of the Lower Jaw. M, Myxomatous tissue, composed of delicate fibrous bundles; M 1, The bundles coarser still, exhibiting the reticular arrangement; M 2, The fibrous bundles, broad, inclosing fields of a myxomatous basis-substance; V, V, Large capillary blood-vessels. × 200.

ment of normal fibrous connective tissue. At first the tissue is apparently nothing but an aggregation of indifferent or medullary

corpuscles, the tissue nature of which is determined only by the fact that all corpuscles are united with one another by means of delicate threads. The corpuscles themselves are originally small homogeneous lumps, of a high degree of refraction. Soon afterwards a number of such indifferent corpuscles assume a granular appearance, and between them an extremely delicate reticulum appears as the first trace of a recticular structure. At this stage of development, which we often see in inflamed tissue, some authors have spoken of an adenoid or lymph-tissue, by which designation is meant the appearance of a delicate myxomatous reticulum. In the next stage many of the medullary corpuscles are transformed into a myxomatous basis-substance, which with lower powers of the microscope looks either homogeneous or finely granular. Fields of such transformed medullary corpuscles have either one or several corpuscles unchanged, and are bordered by a delicate fibrous recticulum, at the points of intersection, at which small oblong or globular corpuscles are seen. In this stage of development the tissue is called purely myxomatous.

If, by a further splitting up of the medullary corpuscles into delicate spindles, the fibrous reticulum is augmented, and the fields of myxomatous basis-substance narrowed, we have a transition from myxoma into myxo-fibroma, and this transition is the more marked the broader the bundles of fibrous connective tissue. All these stages, to be sure, cannot be traced in direct transition from one into another, but we conclude, from observing the successive portions of the same tumor, being medullary at the periphery and fibrous at its base, that the former are the youngest and least developed, and the latter the oldest and most advanced. With the previous theory of secretion of basis-substance, we were at a loss to account for all these phenomena; whereas the theory first advanced by the late Max Schultze (1861), known as the "transformation theory," renders the formation of basis-substance explicable, providing that we keep in mind that it is nothing but protoplasm altered chemically.

III.—Fibroma.

Solid and dense tumors of a very slow growth, starting from the periosteum of the jaw-bones, are of rather frequent occurrence and well known to surgeons. The name given to them was "epulis," which means a tumor growing upon the gum. Obviously this is a misnomer, since we know that tumors of this description take issue as a rule from the periosteum, and invade the gum in a rather secondary way. One of the striking features of such benign tumors is the presence of protoplasmic masses with a varying number of nuclei, the so-called giant cells of previous pathologists. They are present in greatly varying numbers, mainly in that portion of the tumor

nearest the periosteum, often being arranged in groups, and lacking altogether in the peripheral portions of the growth. (See Fig. 3.) When such bodies are visible, as a rule they are surrounded by embryonal tissue, and it is easy to observe their origin from a varying number of medullary corpuscles. The latter coalesce, thereby losing their individual boundary lines, and produce a uniformly gran-

FIG. 3.

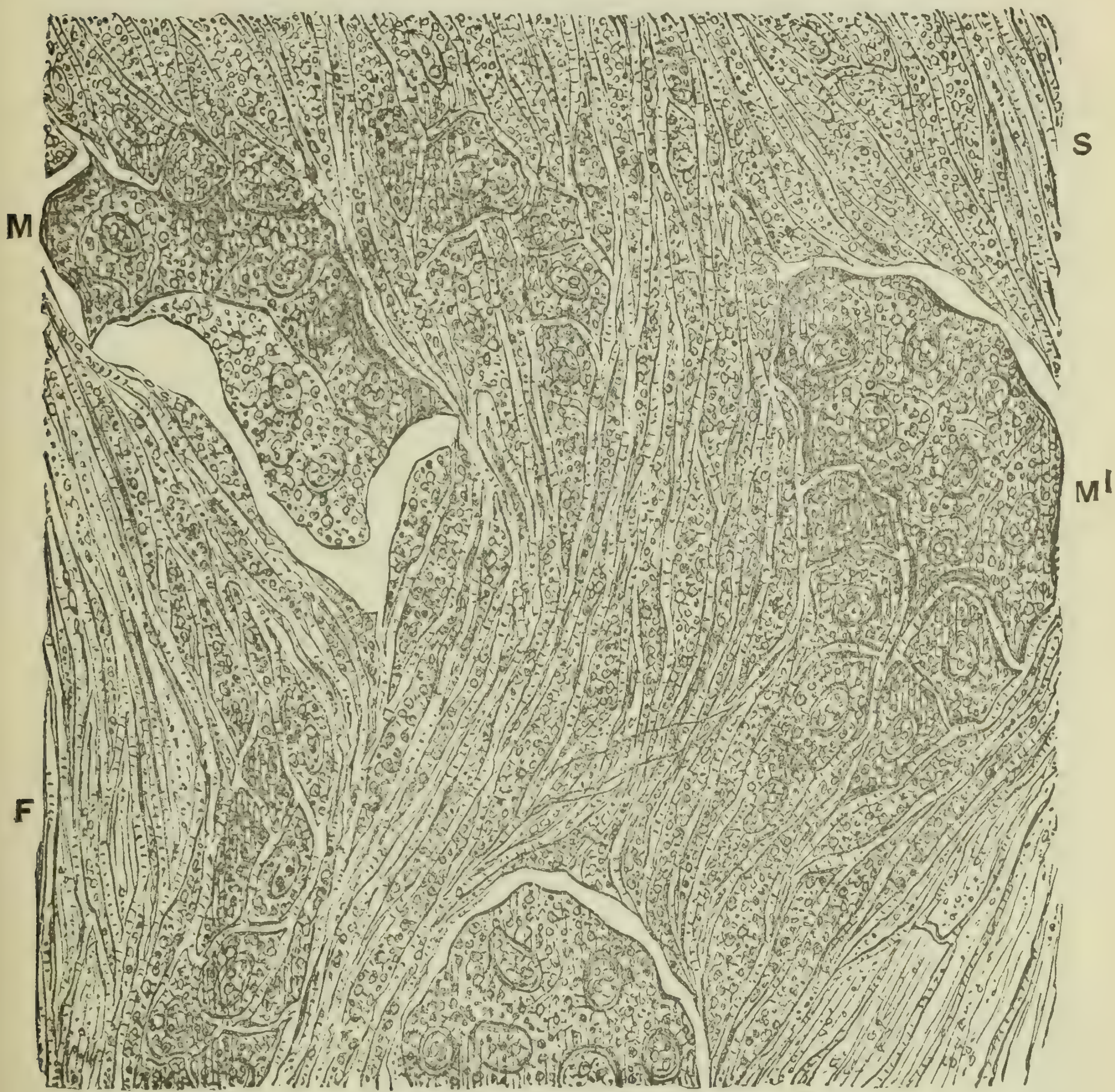


FIG. 3. Base of Fibroma with Multinuclear Bodies, so-called Giant Cells. S, Spindle-shaped medullary corpuscles; F, Fibrous basis-substance having originated from spindle-shaped medullary corpuscles; M, Multinuclear body retracted from the surrounding medullary tissue; M 1, Multinuclear body in connection with large medullary or endothelial elements. × 600.

ular mass of protoplasm, in which we recognize either scattered nuclei or coarser granules, so-called nucleoli. Around the corpuscle, which is often of irregular shape, sending offshoots into the neighboring medullary tissue, the adjacent medullary corpuscles produce a kind of capsule, between which and the multinuclear bodies a gap is not infrequently seen,—caused, as it were, by the shrinkage of the "giant cell." It is known that bodies of this description are often

met with in the normal medullary tissue of forming and growing bone. We often find them in those bay-like excavations that appear in the cementum and dentine of temporary teeth during the pro-

Fig. 4.

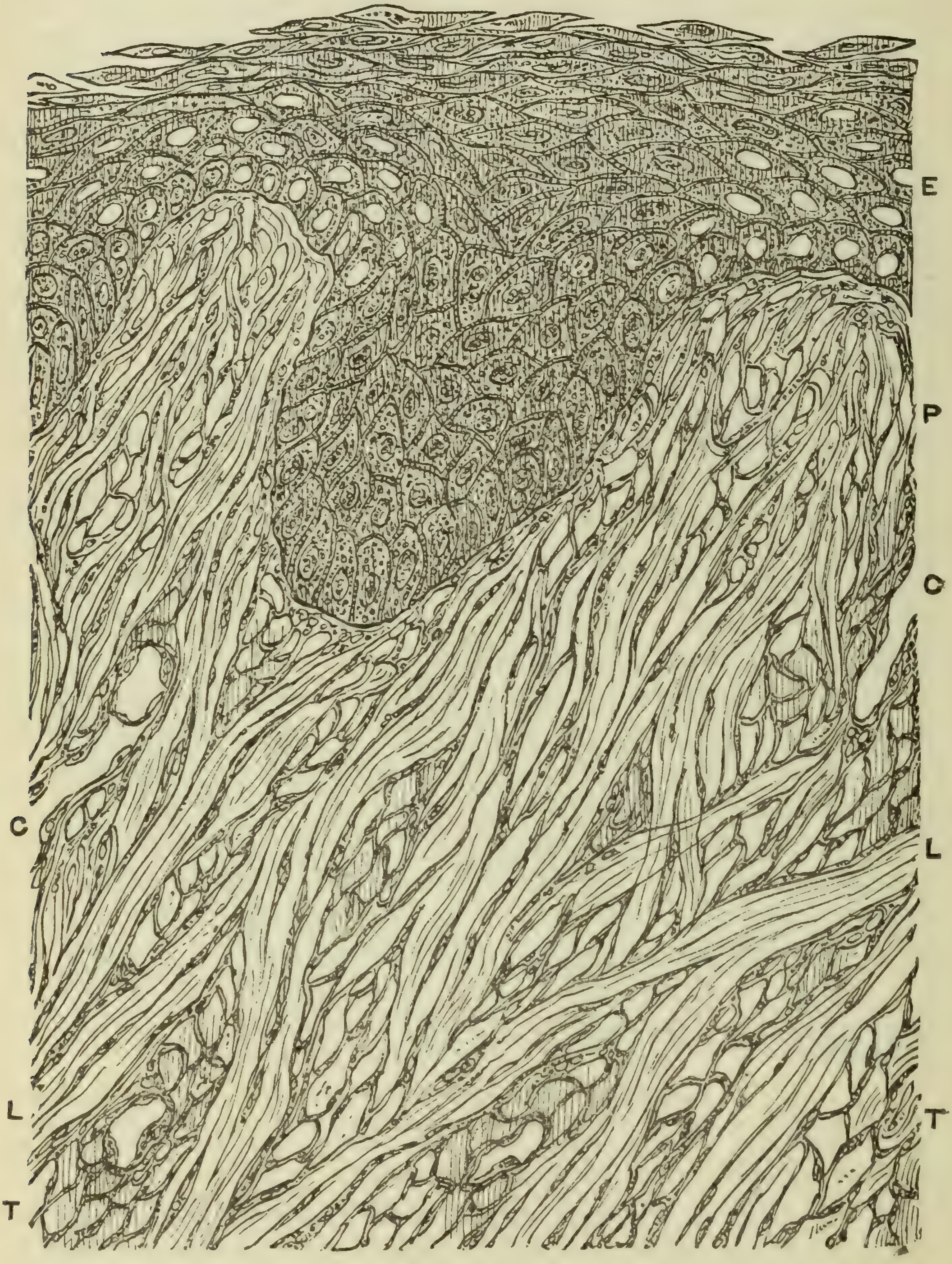


Fig. 4. Fibroma of the Alveolar Process of the Upper Jaw. E, Stratified epithelium of the gum; P, Blunt papillæ of the gum; L, L, Longitudinal; T, T, Transverse sections of bundles of fibrous connective tissue; C, C, Capillary blood-vessels. × 200.

cess of their absorption. The prevailing idea as to their significance is that they grow by coalescence of leucocytes or medullary corpuscles, from without into the cement or dentinal tissue, liquefying in

their way these tissues, and breaking them up. Hence their name, "osteoclasts," or "bone-breakers."

We must decidedly disagree with such views, since we have seen multinuclear protoplasmic bodies arising from the living matter of cementum and dentine itself, after the dissolution of the lime-salts, and the liquefaction of the basis-substance. We furthermore have often seen such bodies in the medulla, preceding the formation of bone-tissue. Since the territories of formed bone-tissue often are transformed into such multinuclear bodies, the idea becomes admissible that they can appear previous to development of the osseous territory; and to this view corresponds their presence in the periosteal portion of fibrous tumors. We admit, however, that this view does not account for the presence of so-called giant cells in every instance, since, as we will show later on, they accompany blood-vessels, and are known to exist in inflammatory products,—for instance, in tubercles.

The tumor before us appeared on the alveolar process of the upper jaw in the shape of a cessile nodule, the size of half a hickory-nut, in a youth about twenty years of age. (Fig. 4.)

The surface of the tumor looked comparatively smooth to the naked eye, whereas microscopical specimens show remnants of the papillæ of the gum, rather shallow and blunt, and some distance apart. The outer coating is made up of stratified epithelium, whose layers are noticeably diminished, probably owing to the pressure of the growth from within. The first row of columnar epithelia is well marked only in the valleys between the remnants of the papillæ, while on their summits the first row is composed of short columnæ, or rather cuboidal epithelia. In these places both the epithelia of the first and the neighboring epithelia of the adjacent layers exhibit central vacuoles, or plasmatic spaces, from which the nuclei have dropped out.

The bundles of the fibrous connective tissue are of considerable breadth throughout the mass of the tumor, but their breadth increases from the outer to the deeper portion. The protoplasmic tracts are well marked between the bundles, both in longitudinal and transverse sections. The bundles are freely decussating or interlacing, by which an extremely dense trestle-work, similar to that of the derma of the skin, is produced. The vessels are scanty throughout the tissue, consisting mainly of capillaries.

At the outer portion of the tumor, between the bundles, small nests of medullary tissue are discernible. The deepest portions, on the contrary, are made up largely of medullary tissue, composed of globular and spindle-shaped corpuscles, with a goodly number of interspersed multinuclear bodies. The latter feature does not mean a

transformation from the benign fibroma into a malignant myeloma, but the juvenile condition of the connective tissue, and a somewhat

FIG. 5.

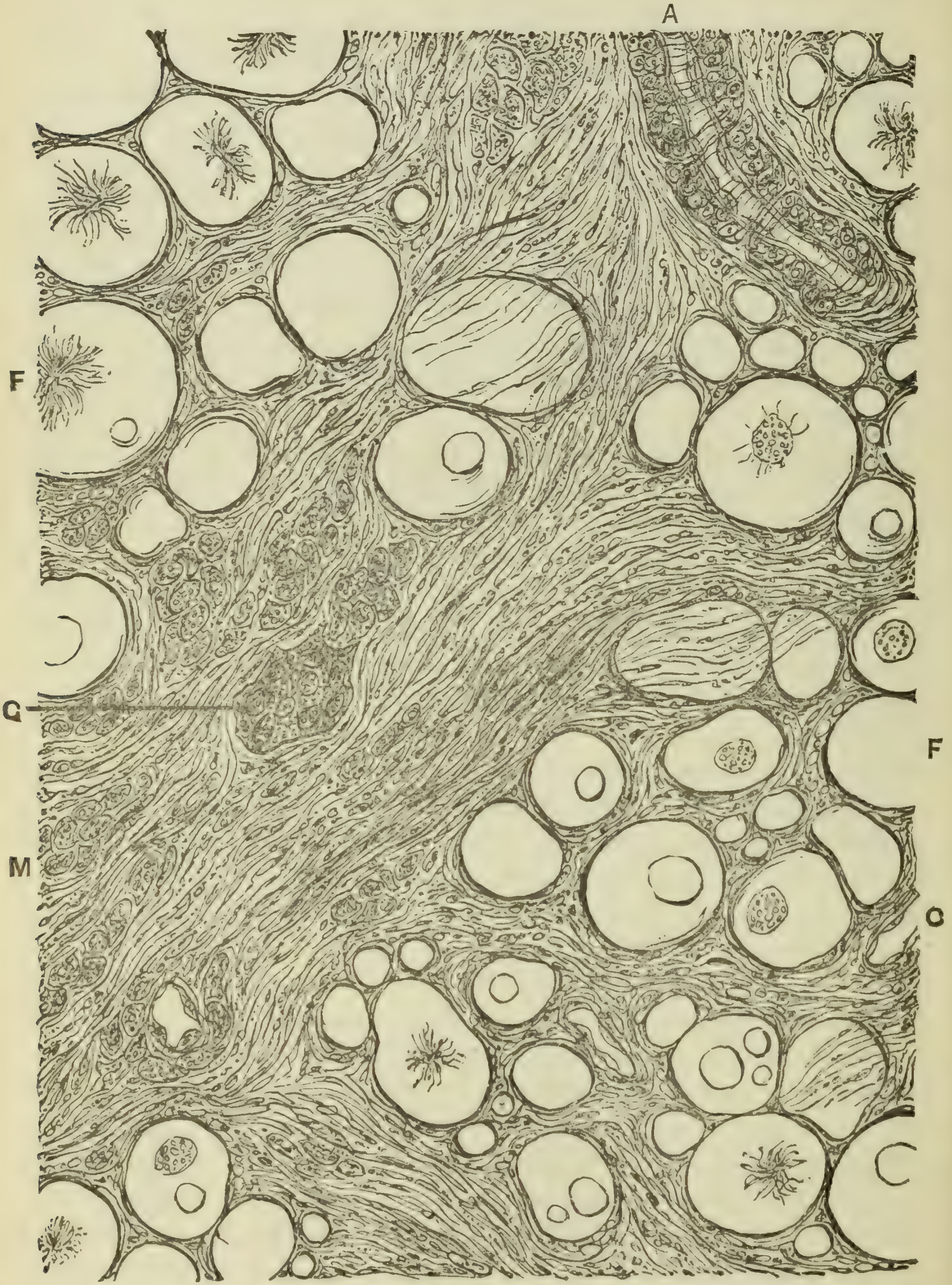


FIG. 5. Lipo-Fibroma of Lower Jaw. F, F, Fat-globules; M, Clusters of medullary corpuscles; G, Multinuclear body or giant cell; A, Artery. $\times$ 200.

accelerated growth from beneath. This is proven from the fact that the tumor did not return after removal.

IV.—Lipo-Fibroma.

In our collection there is no tumor from the jaws made up of fat to such an extent as to warrant a diagnosis of lipoma. One specimen, however, removed from the lower jaw, the size of a cherry, shows a combination of fibrous connective with fat tissue, and thus gives the variety expressed in the title. The fat-globules are greatly varying in size, and either arranged in groups or scattered singly in the connective tissue; arteries are accompanied by rows of such globules. Most of the latter contain vacuoles and peculiar star-shaped formations in their centers, which very probably are not crystals of margaric acid, as some previous observers have believed, but remnants of protoplasm, known to exist in each fat-globule. (See Fig. 5.)

The connective tissue is of two kinds, viz., partly broad and heavy bundles, and partly narrow spindles, not arranged in distinct bundles. These two varieties are intermixed without any regularity throughout the entire tumor, the latter being especially conspicuous in the neighborhood of the fat tissue, where it produces a thin layer, carrying blood-vessels between the fat-globules, or surrounds groups of them. The connective tissue contains a number of clusters of medullary corpuscles, which, if flattened out and rendered polyhedral by mutual pressure, present the aspect of endothelia, and if coalesced into one mass represent multinuclear bodies or giant cells. The history of development of fat tissue demonstrates that each globule of a larger size arises from a number of medullary corpuscles, which are transformed chemically into fat, whereas the central portions remain unchanged protoplasm, with branching offshoots; much on the plan of territories with central cartilage or bone-corpuscles. Small fat-globules may be the products of transformation of single medullary corpuscles, or a limited number thereof. It has long been known that, in animals in which emaciation is induced rapidly by starvation, each fat-globule breaks up into a number of medullary corpuscles,—viz., into the embryonal material which originally gave rise to the formation of a globule. If we recall the fact that each fat-globule is surrounded by a thin connective-tissue corpuscle, invariably supplied with a nucleus, fat at once appears as a variety of myxomatous tissue, the difference being only a chemical alteration of the protoplasm into carbohydrates or fat, instead of a mucoid basis-substance.

From this point of view, the clusters of medullary or endothelial corpuscles would simply represent a pre-stage of future fat-globules or remnants of previous ones. Since multinuclear bodies or giant cells are known to result from a coalescence of medullary or en-

dothelial corpuscles, there is good reason to assume that these bodies likewise would represent eventually either a previous or a past stage of fat-globules. A fat-globule, according to our view, is a globular territory with a central protoplasmic body, growing in exactly the same manner as a territory of myxomatous, cartilaginous, or osseous tissue; the nucleus always belonging to the capsule around the globule, and not to the globule itself. A territory of any of the named tissues will break up, in the process of physiological or reduction in pathological conditions, into clusters of medullary corpuscles, or into multinuclear protoplasmic bodies.

V.—Angioma.

A boy, eleven years of age, presented himself with a tumor the size of a small hickory-nut on the gum of the lower jaw, occupying the region of the right lateral incisor and cuspid, having its rise in a somewhat narrow pedicle between the teeth. The surface was nearly smooth, slightly lobulated; its consistence rather soft, and easily compressible; its color dark-red. Pressure with the finger rendered the tumor pale, considerably diminishing its bulk at the same time, but as soon as the pressure ceased the previous size and color returned. Three months previously a similar tumor had been removed from the same place, but it almost immediately commenced to grow again with alarming rapidity, causing a slightly uneasy feeling, but no pain.

Vertical sections through the body of the tumor revealed the fact that its interior was composed mainly of blood-vessels, but that it was different in its structure in the outer and inner portions. The former exhibited the features of a lobular, the latter of a cavernous, angioma.

A, Lobular Angioma.—The surface of the vascular or erectile tumor is covered with a stratified epithelium, being normal in its breadth at the borders, and much thinned in the middle portions of the tumor. In the former places there are visible numerous rather shallow papillæ, a certain number of which are united into a group by deep epithelial valleys. In the central portions only a limited number of layers of cuboidal epithelia are discernible, the deepest layer being absent, and replaced by medullary corpuscles to such an extent that no boundary line could be made out between the epithelium and the subjacent connective tissue. (See Fig. 6.)

The connective-tissue layer beneath the epithelium is made up of nucleated granular corpuscles, closely packed together,—so much so that they flatten each other into broad spindles. Bodies of this description are termed endothelia. A limited number of tumors of this variety are known since Bizzoziro, of Italy, drew attention to

their occurrence, and dubbed them endothelioma. They are mainly in connection with lipoma and angioma.

FIG. 6.

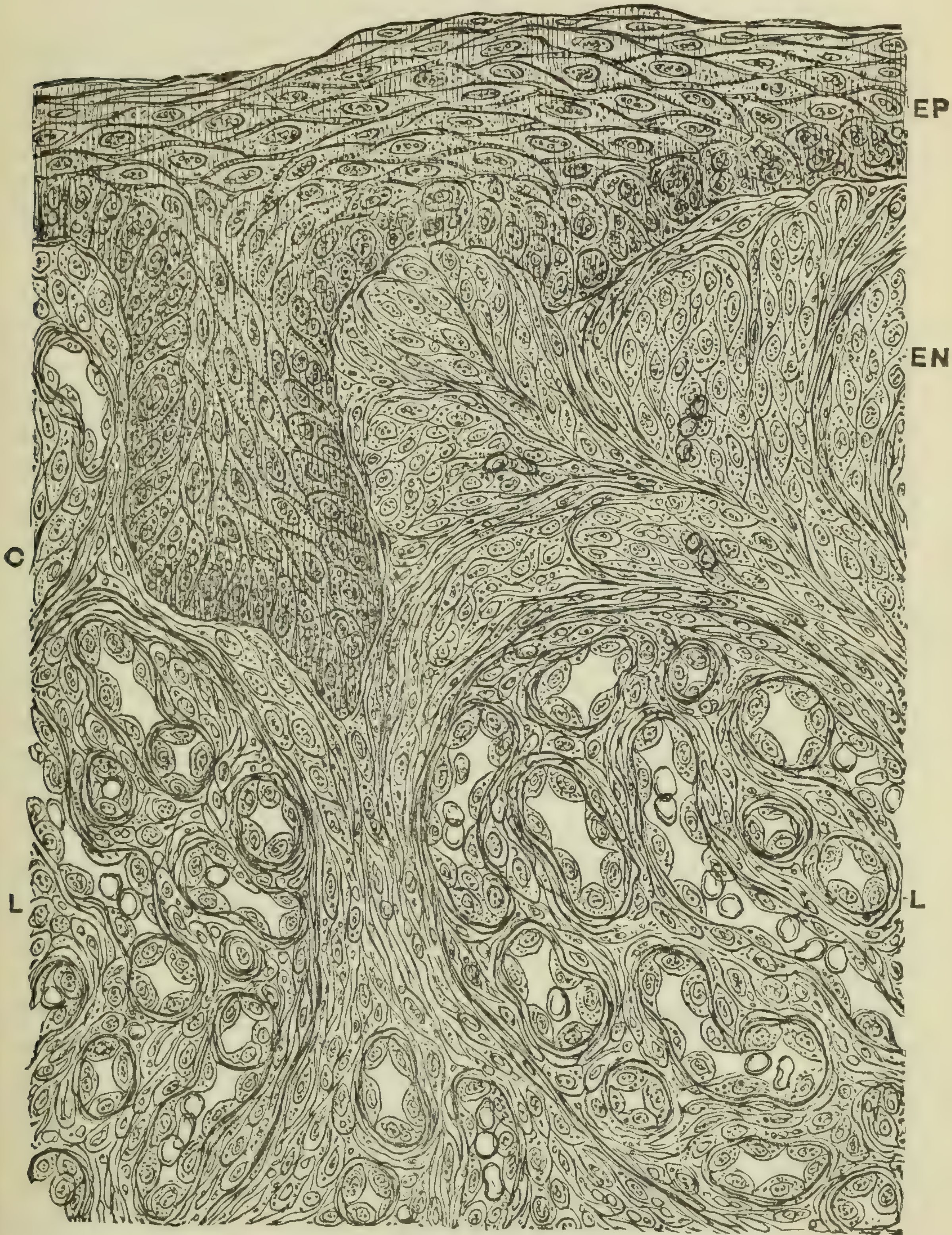


FIG. 6. Lobular Angioma of the Gum of the Lower Jaw. E, P, Stratified epithelium whose columnar epithelia toward the right side are breaking up into medullary corpuscles. EN, Endothelial layer traversed by radiating tracts of a delicate fibrous connective tissue; C, Capillary blood-vessels in the endothelial layer; L, L, Lobules composed mainly of capillary blood-vessels. $\times$ 200.

The endothelia appear to be arranged in clusters, between which delicate tracts of a fibrous connective tissue run in a somewhat radiating order, which tracts, if viewed with higher powers of the

microscope, appear to be made up of narrow, partly-nucleated spindles. The tracts spread towards the periphery in a fan shape, and no clear distinction is possible here between the broad spindles of the endothelia and the narrow spindles of the tracts.

Some distance below the epithelia, or close beneath them, a large number of capillaries are seen cut in longitudinal, oblique, and transverse sections, which means that these blood-vessels are coiled up into a lobular shape. Between the lobules there are either tracts of endothelia mixed with fibrous connective tissue or bundles of the latter alone, and these interstitial tracts bear capillaries of their own, independently of those within the lobules.

The most striking feature in the endothelial layers is the formation of red-blood corpuscles and blood-vessels. At first isolated lumps appear in the endothelia, characterized by a high degree of refraction, and yellow in color. They are smaller than red-blood corpuscles, and are known by the name of "hæmatoblasts." Increasing in size, they assume the appearance and structure of red-blood corpuscles. Clusters of hæmatoblasts, or fully-formed red-blood corpuscles, are surrounded by circular tracts of endothelia, which, being hollowed out in part, lead to the formation of calibers already filled with blood, whereas a number of endothelia of rather large size furnish the walls of the capillaries. Thus the formation of red-blood corpuscles precedes that of blood-vessels, as stated some forty-five years ago by the late Rokitansky, of Vienna. Thus it also becomes plain that the tissue form termed endothelioma is, at least in many instances, a pre-stage of angioma. Obviously the newly-formed blood-vessels, though containing blood-corpuscles from the very issue, are closed tubes or sacules, which later, through a continued vacuolation of the endothelia, inosculate with already formed blood-vessels; their tenants, the blood-corpuscles, entering into circulation.

B, Cavernous Angioma.—The lower portions of the tumor under consideration have a different structure, gradually blending with that of lobular angioma. Here we notice large cavities, at first lined by several layers of endothelia, and containing a varying number of red-blood corpuscles, until at last very large spaces make their appearance, filled with red-blood corpuscles; and thus the character of a cavernous angioma is established. (See Fig. 7.)

We observe, at first, tracts of endothelia accompanied by a delicate fibrous connective tissue, with irregular calibers, in which a liquefaction of a certain number has taken place, as indicated by their hydropic condition, to such an extent that only a delicate frame-work of previous endothelia is discernible. A certain number of endothelia have been transformed into red-blood corpuscles;

another set furnishes colorless blood-corpuscles, or possibly these arise from the nuclei of previous endothelia. This process is known to

FIG. 7.

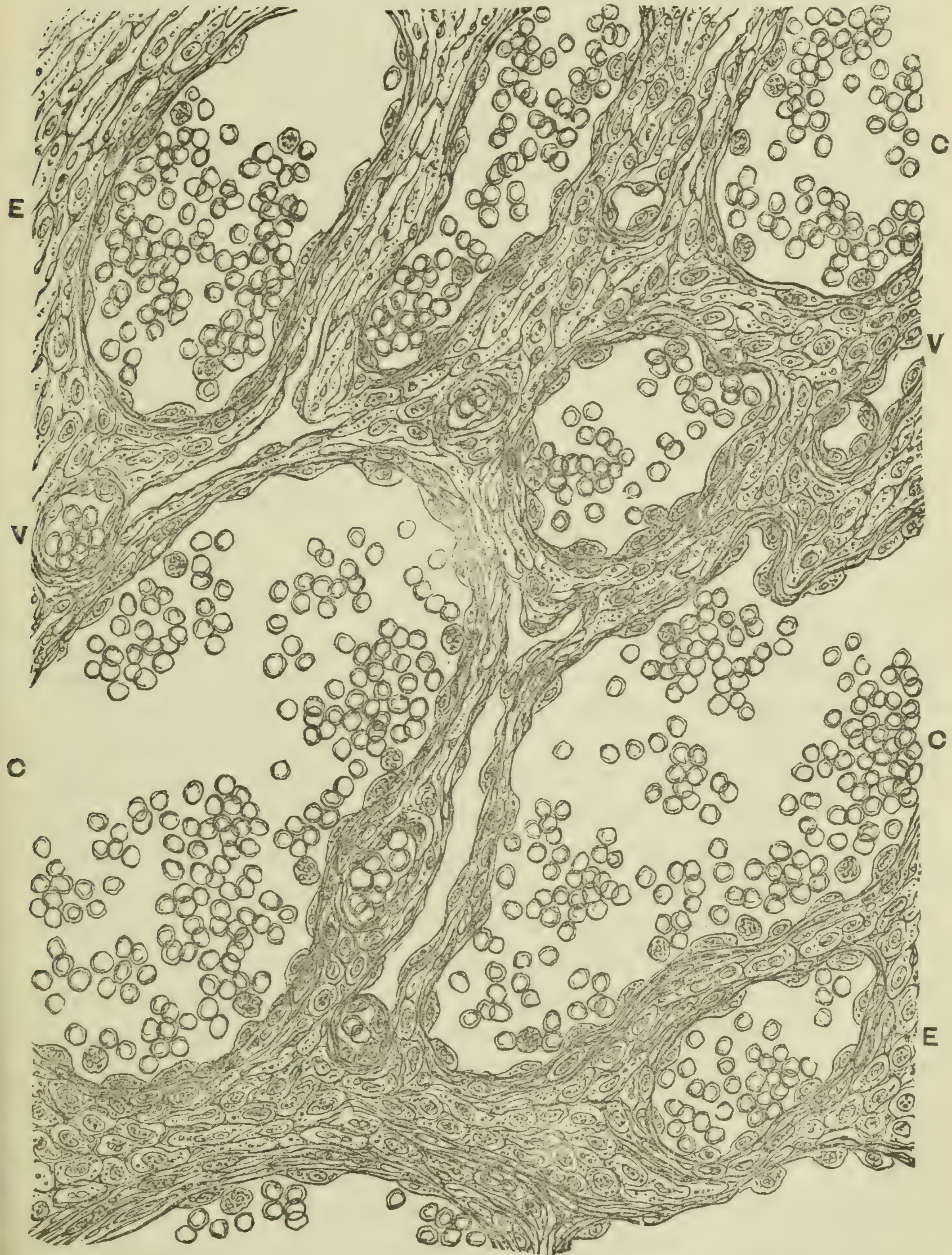


FIG. 7. Cavernous Angioma from the Base of a Vascular Tumor of the Gum. C, C, Cavernous spaces filled with venous blood; V, V, Capillary blood-vessels of the trabeculæ bounding the cavities; E, E, Endothelia in transition, partly into myxomatous and partly into fibrous connective tissue. × 200.

histologists by the term of "vacuolation of the endothelia." The calibers at first are very irregular, being bounded by several layers

of endothelia, and it sometimes occurs that tolerably well-formed calibers of the same vessel are connected with one another by narrow canals, owing to the presence of little changed endothelia. Blood-corpuscles may be seen in one part of the caliber, and are absent in another, so long as the vessels are not complete. The remaining endothelia are large and supplied with oblong nuclei of considerable size.

Fully-formed cavities in connection with the physiological vessels are characterized by smaller endothelia, not surpassing in size those of normal veins. The trabeculæ inclosing the venous cavities are made up of fibrous connective tissue, carrying their own capillary blood-vessels. In many places, however, even the trabeculæ are made up of endothelia, and it is easy of demonstration that the endothelia are merely the medullary or embryonal stage of connective tissue, since we can trace its transformation both into myxomatous and fibrous connective tissue. This portion of the tumor contains solid masses of a dense fibrous connective tissue, which in all probability are not newly formed, but represent residues of the former tissue of the gum or the periosteum.

VI.—Myeloma.

In the introduction we have given the reasons why we prefer the term myeloma to that of sarcoma. These tumors are by no means of rare occurrence, as shown by our comparatively small collection, which embraces five specimens of myeloma and its combinations out of seventeen representatives of tumors in general. All these tumors are considered malignant with but one exception, which concerns the variety termed "epulis sarcomatosa," or, as we propose to call it, fibro-myeloma. This variety is well-known to surgeons as admitting of a radical cure if thoroughly extirpated. Multinuclear bodies are of such frequent occurrence that an authority like Virchow speaks of a variety which he calls "giant-cell sarcoma," growing in the majority of cases from the periosteum. We have described, under a previous heading, benign tumors, especially fibroma, containing a varying number of so-called giant cells in their juvenile portions, where medullary tissue prevails, and we have emphasized that no stress is to be laid upon the presence of "giant cells." If the tumor is intermixed with medullary tissue throughout, the diagnosis will be fibro-myeloma, which is still of a low degree of malignity, as shown by clinical experience. We can state positively that the number of multinuclear bodies is of great value for determining the degree of malignity in any given case. The greater their number the surer it is that the tumor is not very malignant, and will not recur if radically removed. On the contrary, the smaller their number

the greater is the malignity and the danger of recurrence; whereas, in the worst cases of pure globo or spindle myeloma, multinuclear bodies are lacking altogether. In such cases the danger to the life of the patient is imminent, in spite of all attempts at thorough eradication.

According to our nomenclature, we will dwell upon combinations such as myxo, fibro, and osteo-myeloma, and at last consider the two purely malignant forms,—viz., globo and spindle myeloma. Either of these forms may arise primarily from the periosteum or medulla of the jaw-bones, or start in the nasal cavity, the antrum of Highmore, or the soft palate, and invade the upper jaw in a secondary manner. In several instances of primary myeloma we found, in the tissue of the tumor, clusters of pigment indicative of a previous hemorrhage, possibly in connection with a traumatism (blow, kick, fall, etc.), which, as is admitted, often causes—for reasons unknown—the growth of malignant tumors.

A, *Myxo-Myeloma.*—This specimen originally started on the soft palate of a young lady near twenty years of age, and after extirpation recurred on the base of the upper jaw-bone, invading in turn both the antrum and the nasal cavities. With low powers of the microscope the tumor shows a thin investment of fibrous connective tissue, fibers from which penetrate the morbid growth, scantily supplied with blood-vessels, and producing imperfect septa, by which an indistinct alveolar structure results. The alveoli are filled with protoplasmic bodies, either globular or spindle-shaped, or provided with numerous offshoots, by means of which a net-like structure is established. (See Fig. 8.)

Globular corpuscles are arranged in clusters, with a scanty intervening basis-substance. Spindle-shaped corpuscles are arranged in tracts, freely connecting at acute angles, and separated from one another by a slight amount of a finely-granular basis-substance. This latter form would correspond to that variety of myeloma termed by Virchow "net-cell sarcoma." The prevailing formation within the alveoli, however, corresponds to the illustration, being composed of very large polymorphous protoplasmic masses, partly containing a number of nuclei, and interconnected by comparatively narrow offshoots in all directions. The basis-substance between these formations is conspicuous, and traversed by an extremely delicate reticulum, which arises from the delicate offshoots in a brush-like manner. This tissue in structure is myxomatous, and being in predominance over the structures before mentioned, entitles the tumor to the name of myxo-myeloma. The myxomatous tissue contains no blood-vessels, which invariably run in tracts of fibrous connective tissue, at rather distant intervals. As the consistence of the

tumor was soft, almost jelly-like, the basis-substance must be of the mucoid or myxomatous variety. In cases where the basis-substance is more firm the tumor has been termed chondro-myeloma, or malignant chondroma, although we would consider the latter term as illogical.

B, Fibro-Myeloma.—Among several tumors of this variety, we have selected the present specimen for description, its clinical history

Fig. 8.

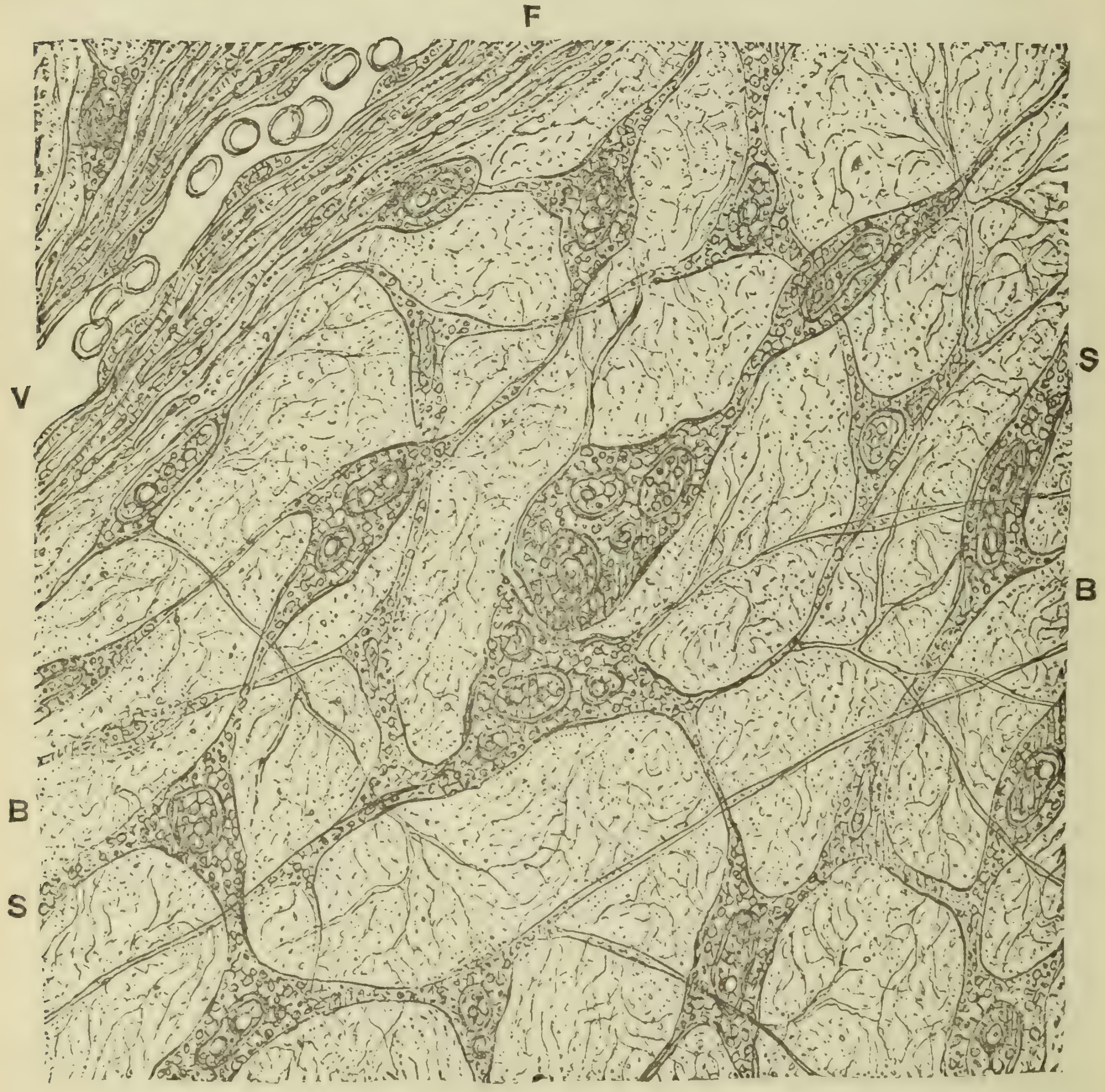


Fig. 8. Myxo-Myeloma of Upper Jaw filling the Antrum of Highmore. F, Tract of fibrous connective tissue; V, Capillary blood-vessel; S, S, Nucleated protoplasmic tracts branching and finely interconnecting; B, B, Myxomatous basis-substance with a delicate reticulum in connection with the protoplasmic bodies. × 600.

being better known. It was located upon the right side of the lower jaw of a man about thirty-five years of age, the size of half a hen's-egg, occupying a space between the first bicuspid and the ramus; the teeth in this situation having previously been removed. Its consistence was firm, its surface slightly nodular, its color purple, and there were nowhere signs of ulceration. For a while previous

to its removal it caused considerable pain of a shooting character. It had grown within about two years.

FIG. 9.

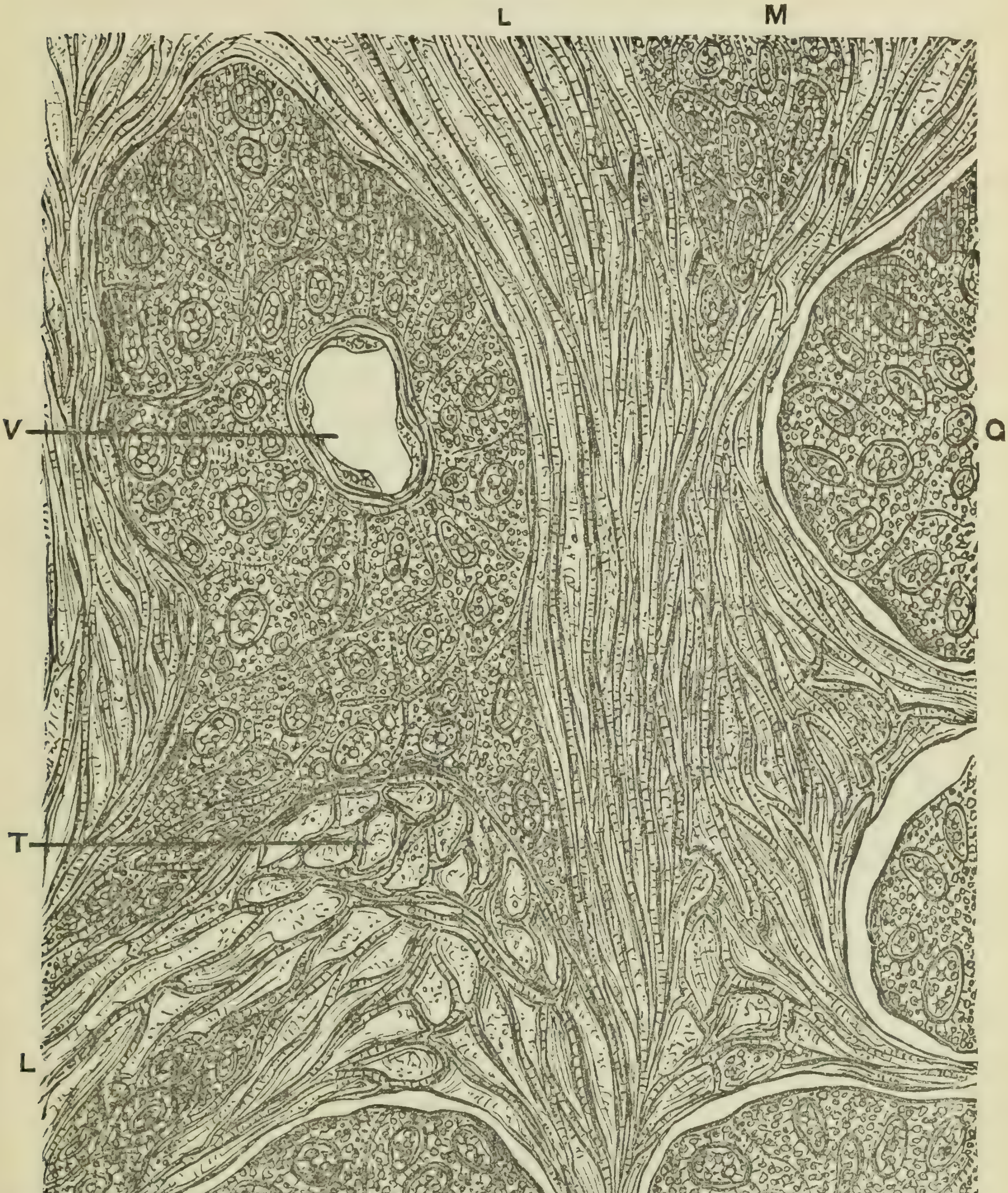


FIG. 9. Fibro-Myeloma with Multinuclear Bodies from the Lower Jaw. L, L, Longitudinal; T, Transverse sections of bundles of fibrous connective tissue; M, M, Clusters of medullary corpuscles; G, G, Multinuclear bodies or so-called giant cells, retracted from the adjacent connective tissue; V, Blood-vessel in transverse section surrounding a cluster of medullary corpuscles. × 600.

Under the microscope the tumor appears to be composed of interlacing tracts of fibrous connective tissue, with interstices filled either

with medullary corpuscles or with multinuclear protoplasmic bodies; the fibrous portion everywhere being in excess over the medullary tissue. (Fig. 9.) The clusters of medullary corpuscles were rather numerous, exhibiting an endothelial appearance. In some places blood-vessels are seen to be surrounded with or accompanied by such medullary corpuscles, and in a few places multinuclear bodies are visible in small numbers; but in a remarkably regular arrangment. The fact that blood-vessels traverse the clusters excludes their being of an epithelial nature, and therefore the diagnosis of cancer, which could be made upon a superficial glance at the tumor, is untenable. This tumor we would not consider a very maligant one, and the diagnosis of a fibroma would be admissible if the medullary nests were not so profusely scattered throughout the tissue.

A far more malignant case of fibro-myeloma is the following: A man about twenty-five years of age showed a hard swelling upon the right upper maxilla, which had developed within three years The tumor occupied not only the region of the alveolar process, but also the antrum of Highmore. Most of the teeth became loose and had been removed, the two last molars being left, but very loose, and nearly imbedded in the dark-red mass of the tumor. The diagnosis was malignant tumor, either cancer or myeloma. The whole right maxilla was extirpated, and a portion of the alveolar process with a tooth in it came into our possession.

At the microscopical examination no trace of a bony structure could be found; the mass of the tumor consisting mainly of clusters of small globular shining corpuscles, between which an indistinct fibrous reticulum was discernible. The clusters were separated from each other by bundles of fibrous connective tissue, greatly varying in amount; the surface of the tumor was bordered by an indistinct capsule of the same tissue, which itself contained smaller clusters of myeloma corpuscles, and showed irregular, blunt elevations belonging to the gum, and covered with a thin layer of stratified epithelium.

In the neighborhood of the tooth the pericementum was still recognizable, in the shape of straight bundles of fibrous connective tissue, still in connection with the cementum, but crowded with myeloma corpuscles. (See Fig. 10.)

In this situation it is evident that the tissue of the myeloma grew at the expense of the fibrous connective tissue of the pericementum. In some places the bundles of the latter tissue are still broad, containing in their middle slit-like groups of medullary corpuscles. In other places these corpuscles have replaced the bundles to a great extent; still further, only scanty and thin bundles are seen traversing the tissue of the myeloma. At the last elements of myeloma oc-

cupy large fields, with scanty or no fibrous tissue between them. Obviously the process of transformation is explicable only if we admit that the whole of the fibrous connective tissue, the protoplasmic

FIG. 10.

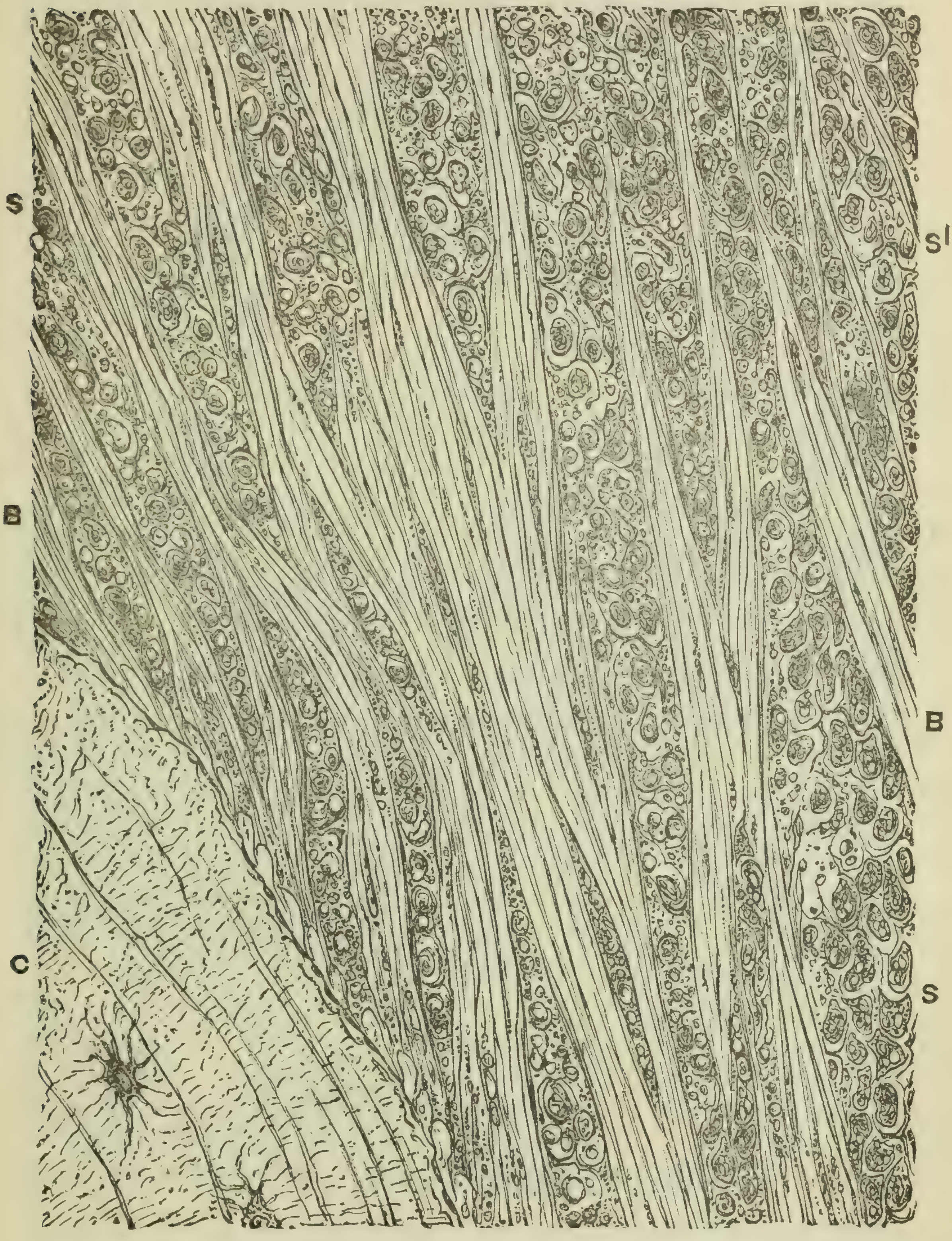


FIG. 10. Fibro-Myeloma of the Upper Jaw invading the Pericementum. C, Cementum; B, B, Bundles of fibrous connective tissue; S, S, Clusters of myeloma corpuscles between the bundles; S 1, Transformation of the bundles into the tissue of myeloma, with scanty traces of the bundles. × 200.

bodies as well as the basis-substance, is supplied with living matter, from which the new formation of the medullary corpuscles takes its origin.

If we confine ourselves to the examination of a limited portion of this tumor, no differentiation between myeloma and an acute inflam-

Fig. 11.

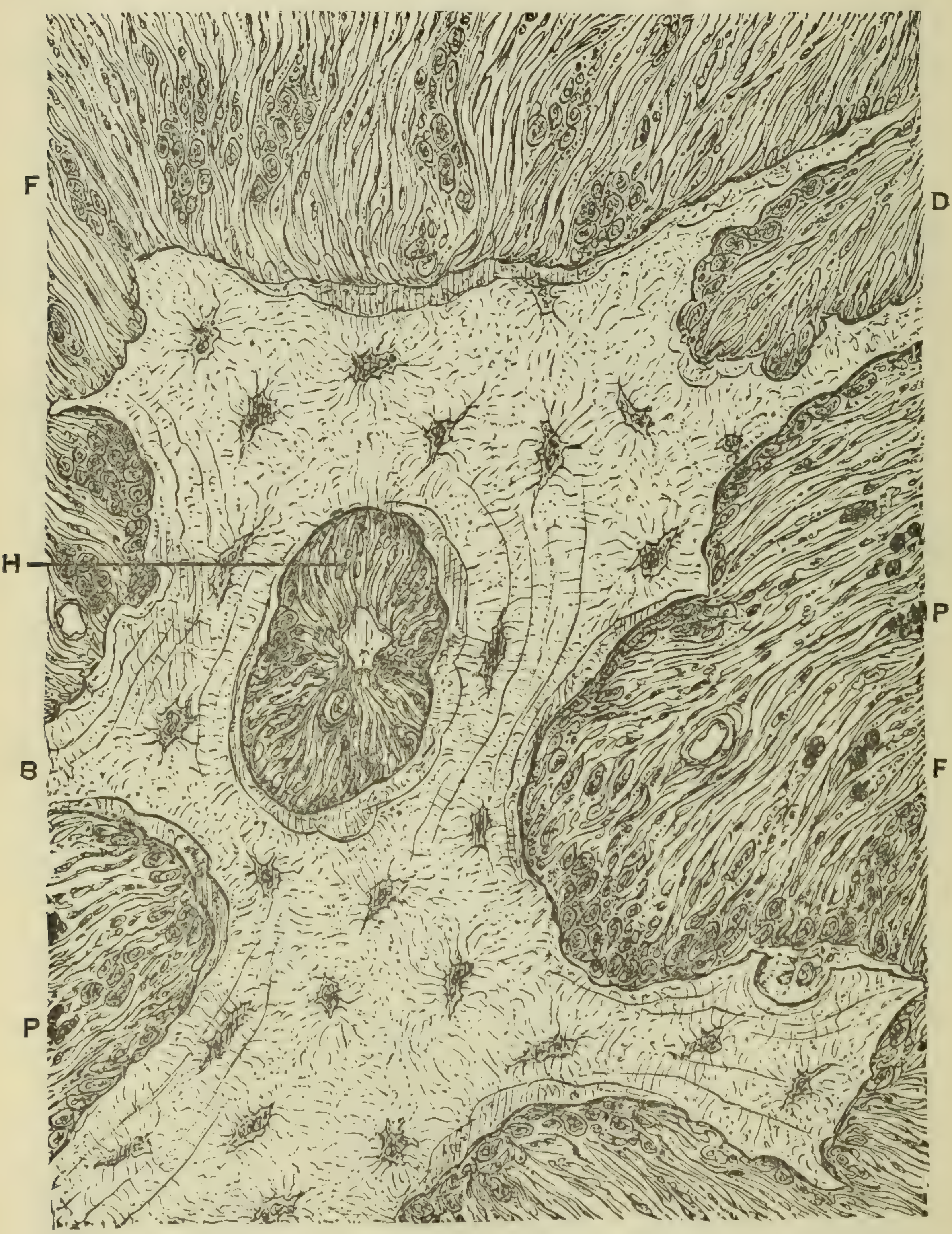


Fig. 11. Osteo-Fibro-Myeloma of the Alveolar Process of the Upper Jaw. F, F, Fibrous connective tissue with numerous clusters of medullary corpuscles; P, P, Clusters of pigment granules; B, Trabeculæ of bone indistinctly lamellated with normal bone-corpuscles; H, Medullary space with central blood-vessels; D, Bay-like excavation of the bone. $\times$ 200.

matory process can be made out, since the medullary corpuscles constituting myeloma are identical with inflammatory corpuscles

about ready to break up into pus. It should also be borne in mind that a rapidly-growing cancer may change its character into that of a myeloma, or fibro-myeloma, as first stated by Virchow. In specimens of such rapidly-growing tumors we have always to keep a sharp lookout for epithelial nests, the presence of which would be evidence of cancer. Should such nests be absent, we diagnosticate myeloma. We are, however, aware that either of these tumors involves considerable danger to the life of the patient.

C, Osteo-Myeloma.—This tumor was found in the mouth of a lady aged about thirty, in the region of the bicuspids upon the left upper jaw, and had reached the size of half a robin's-egg in a year and a half, the teeth having previously been removed. The tumor exhibited the structure of a fibro-myeloma, invading mainly the alveolar process, which was reduced to minute remnants of bone scattered throughout the tissue. (See Fig 11.)

The term osteo-myeloma is confined to growths primarily arising in the medulla of bone, or to growths holding newly-formed bone-tissue. As the tumor in this instance started in the medulla of the aveolar process, and is largely intermixed with fibrous connective tissue, its proper title would be osteo-fibro-myeloma. The remnants of bone-tissue give evidence of its transformation into the mass of the tumor through the intervening stage of medullary tissue. In a few places we find near the border of trabeculæ enlarged lacunæ containing several medullary corpuscles, obviously sprung from previous bone-corpuscles, and still surrounded by a calcified basis-substance. In other places a number of bone-corpuscles are seen connected by means of broad offshoots into chains. In still others, the first step toward the dissolution of the bone-tissue is the appearance of bay-like excavations corresponding to a previous territory, in which protoplasm makes its appearance; or the border of the bone is split up into a number of medullary corpuscles, which are not yet entirely freed from basis-substance. All this is strong proof that the bone actively participates in the new formation of the morbid tissue, the same as it participates in the process of inflammation· To say, as some authors do, that the bone is simply eaten up from without by the newly-formed tissue, does not prove much acuteness of observation; since it is by no means difficult to satisfy one's self as to the active proliferation of the bone-corpuscles within the lacunæ. It is invariably the medullary corpuscles that first appear from bone-tissue, and by subsequent splitting into spindles and reinfiltration with basis-substance give rise to the fibrous portion of the morbid growth.

D, Globo-Myeloma.—This specimen was obtained from a tumor taken from the mouth of a young lady about twenty years of age.

It was located on the right upper jaw, in the region of the bicuspids, and had grown to the size of half an English walnut in about two years. The teeth had previously been removed. It was diffusely infiltrated toward the neighboring tissue, and evidently started from the periosteum. (See Fig. 12.)

The most striking feature was the scarcity of fibrous connective tissue, which in delicate bundles traverses the growth without any regularity. The main mass is composed of medullary corpuscles, either globular or polygonal, the latter produced by mutual pressure. Between small groups of such corpuscles extremely delicate septa of fibrous tissue are visible, in which the blood-vessels are located; though present only in small numbers.

Higher powers reveal two facts,—viz., first, that the corpuscles are interconnected by delicate radiating offshoots, traversing the nar-

Fig. 12.

Fig. 12. Globo-Myeloma of the Periosteum of the Alveolar Process of the Upper Jaw. B, Delicate bundles of fibrous connective tissue; G, Globular corpuscles of myeloma in different stages of development. × 600.

row spaces between them; secondly, that in a limited field of the tissue all stages of development of myeloma can be made out.

We see small granules of a high refraction, structureless, not even reaching the size of colorless blood-corpuscles. We see larger granules and lumps with a varying number of vacuoles in their interior. We furthermore see lumps with large, compact nuclei, and at last corpuscles with reticulated nuclei, with granules in their interior, and of the ordinary recticulated structure of protoplasm. Any granule within the protoplasm may grow to the size of a nucleus, or a nucleated corpuscle; the nuclei themselves are in an active process of division, as shown by numerous dumb-bell forms, and figures of double or treble nuclei within a single corpuscle. All this is proof of a very rapid multiplication of the corpuscles, causing an ex-

tremely rapid growth of the tumor, and indicative of a high degree of malignancy. In accord with the latter features, not a single multinuclear body or "giant cell" can be seen, not even where somewhat broader bundles of fibrous tissue, probably belonging to the periosteum, are present.

E, Spindle Myeloma.—This tumor, corresponding to what Virchow has termed "spindle-cell sarcoma," is represented in our collection by a specimen the history of which is unknown to us. All we can say is that it had grown in the upper jaw. (See Fig 13.)

The tumor is largely composed of spindles, but in some places globular corpuscles are seen, which feature would entitle the tumor to the name of a combined globo-and-spindle myeloma. The tumor

FIG. 13.

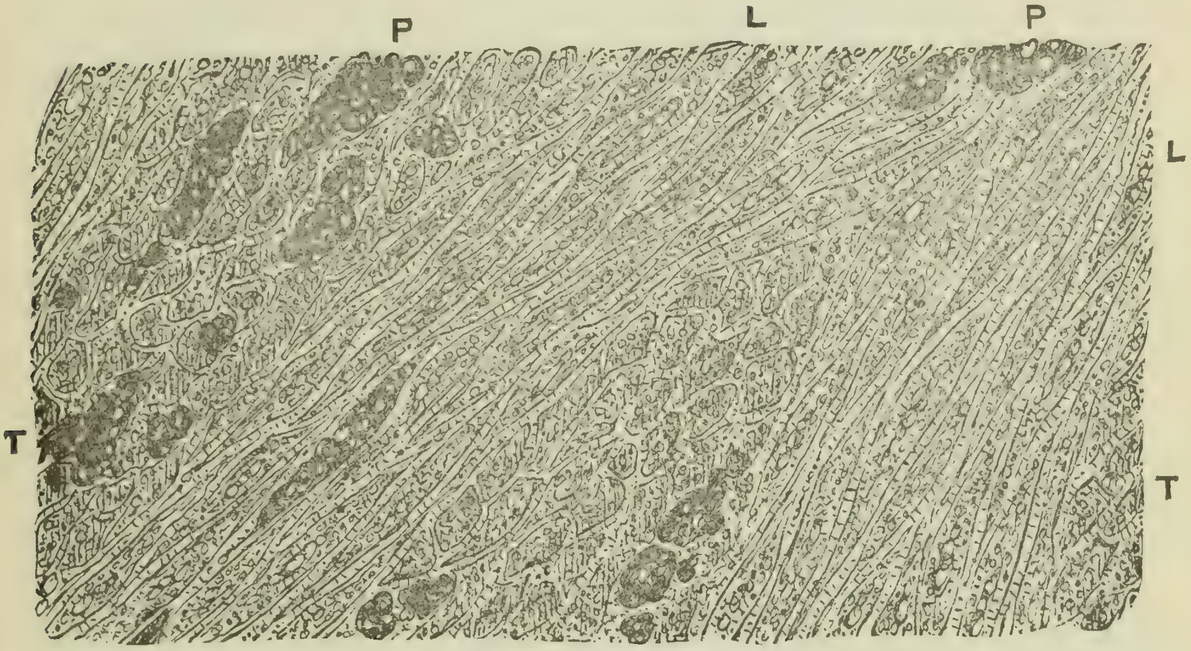


FIG. 13. Spindle-Myeloma of Upper Jaw. L, L, Longitudinal sections of spindles; T, T, Transverse sections of spindles; P, P, Clusters of pigment from previous hemorrhage. × 600.

has comparatively little of fibrous connective tissue, in which scanty blood-vessels are running. The spindles are arranged in interlacing groups,—so much so that in almost every field we meet with longitudinal and transverse sections of spindles, all of which are interconnected by delicate offshoots. The rapid growth of the tumor is indicated mainly by coarsely-granular nuclei, or chains of coarse granules, replacing the nuclei. In some places clusters of red-brown pigment granules are seen, but in such small numbers that the tumor cannot be properly called pigmented or melanotic myeloma. The pigment appears either in spindle-shaped or irregular clusters, partly within and partly between the spindle-shaped corpuscles. These pigment clusters are unquestionably the result of a previous hemorrhage, possibly caused by a mechanical injury, giving issue to the myelomatous new growth.

VII.—Carcinoma.

This type of tumors is characterized by the presence of epithelial nests, scattered without regularity in the connective tissue, which may be either myxomatous or fibrous. Most pathologists claim that cancer may orginate only in such tissues as are covered with or contain normal epithelia. The mucosa of both the oral and nasal cavities is the starting-point of cancerous growths, and in the upper jaw there is an additional source in the mucosa of the antrum. Again, the cancer may be primary in the tissue just named, or secondary by invasion from the skin or any glandular formation,—for instance, from the salivary glands.

There are three varities of cancer recognized by modern pathologists,—viz., first, scirrhous, with comparatively small nests of ephthelia, and a large amount of fibrous connective tissue around the nests; second, epithelioma, with concentrically arranged flat epithelia filling the nests, and a varying amount of fibrous tissue between them; and, third, medullary cancer, with small and irregular epithelia in the nests, and a scanty fibrous tissue between them. Of these three varieties our collection has two,—viz., epithelioma and medullary cancer, both having reached the upper jaw from adjacent epithelial structures, skin and mucous membrane.

A, Epithelioma.—We have two cases of this type of cancer, both from men over forty years of age. In one the tumor arose in the mucosa of the antrum, and in the other in that of the floor of the nasal cavity, both being similar in structure. (See Fig. 14.)

In viewing a specimen of epithelioma from the mucosa of the antrum, we observe marked differences in the structure of the epithelia. Near the boundary toward the connective tissue they are smaller and narrower than in the middle portions of the nests. They are often replaced by a row of medullary corpuscles, to such an extent that no sharp boundary line exists between the connective tissue and the epithelial nest. This obviously means a gradual transformation of the medullary into epithelial tissue, a process which leads to the increase of the bulk of the nests and a decrease of that of the connective tissue. At last, even the blood-vessels being obliterated, the nests are deprived of nourishing material, and a local necrosis—viz., ulceration—takes place, which is a common feature in all cancers.

The second prominent feature is an active new formation of living matter in the epithelia. This causes the nuclei to become homogeneous; then assuming an hour-glass shape, and lastly a division into several nuclei. Not infrequently we see several nuclei or several medullary corpuscles within a considerably enlarged epithelium. Such formations have been termed "mother cells" by previous path-

ologists, whereas to-day we know that they are the outcome of an active endogenous new formation. Around the nucleus often are

FIG. 14.

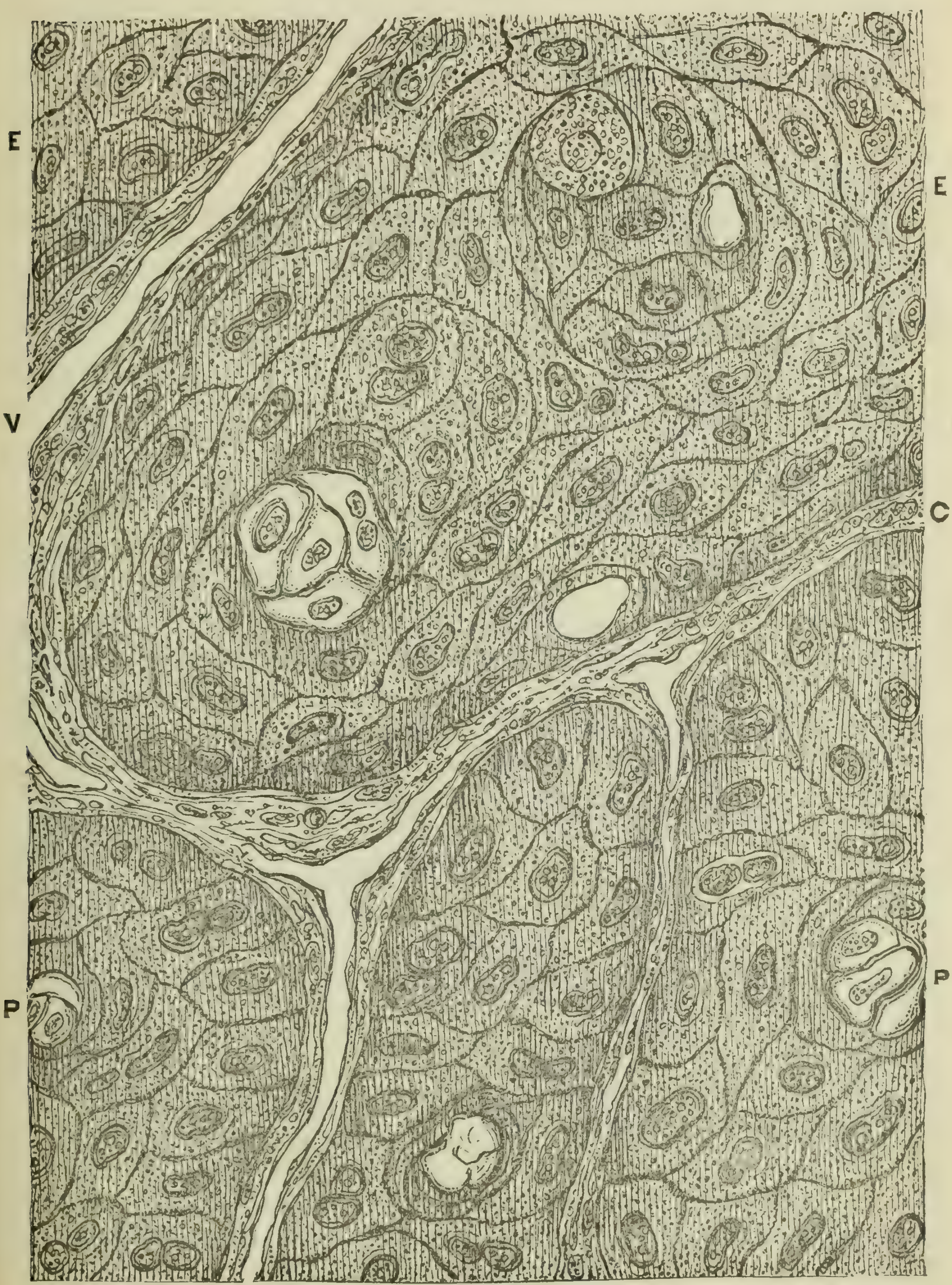


FIG. 14. Epithelioma of the Mucosa of the Antrum. C, Delicate fibrous connective tissue crowded with medullary corpuscles ; V, Capillary blood-vessels in the connective tissue; E, E, Epithelial nests made up of concentrically arranged flat epithelia; P, P, Cancer-pearls composed of changed epithelia. × 200.

seen vacuoles, or plasmatic spaces, which evidently contain nourishing liquid, enabling the nucleus to rapidly increase its amount of

living matter, with the result of fission and division, with a rapid new formation of epithelia. Except where the nucleus is surrounded by a vacuole, it is in connection with the adjacent protoplasm of the epithelium, by means of delicate conical offshoots. Similar offshoots also traverse the cement-substance between the epithelia, thus uniting all into a continuous mass of protoplasm. The central portions of the nests often contain groups of epithelia, which have assumed a high degree of refraction, a yellowish color, and a homogeneous appearance. At first the nuclei remain, though faintly discernible; but in the more advanced degrees of this metamorphosis even the traces of nuclei are lost, and a certain number of epithelia are transformed into structureless glistening plugs, representing the well-known cancer-pearls. The nature of this process is not yet known.

The connective tissue is either of the myxomatous or fibrous variety; never very rich in blood-vessels; mainly capillaries and veins. In many places the connective tissue is crowded with medullary or lymph-corpuscles, between which a delicate reticulum is seen. Some authors claim that this is the result of an inflammatory reaction of the epithelial upon the connective tissue, whereas we claim that it is the medullary condition of the connective tissue from which new epithelia arise. We base our views upon direct observation, since we know that if, after removal of cancer-nests, lymph-corpuscles be left behind, even though at a great distance from the cancer itself, the disease will invariably recur. This fact urges upon us the necessity for removal of large portions of tissue in the neighborhood of cancer. Modern surgeons, by clinical experience, have reached the same conclusion, which they consider the only safeguard again relapses, so very common in this disease. Unfortunately, we are not able to say why the lymph-corpuscles or the medullary tissue, into which the connective tissue is transformed in an almost identical way with inflammatory infiltration, should have such a marked capacity for changing into epithelia; in other words, wherein the contagion of the tissue lies.

B, Medullary Cancer.—Our specimen is taken from the enormously enlarged alveolar process of the upper jaw of a man over sixty years of age. Twelve years previous to his death he was first operated upon for a so-called rodent ulcer, upon the left wing of the nose, which about fifteen years previously had orginated from a slight injury, causing a shallow ulcer, which could never be induced to heal. The scooped-out particles of tissue from the first operation were examined under the microscope, and showed the structure of a shallow or flat epithelioma, which previous authors termed "rodent ulcer."

Repeated recurrences and operations took place afterwards, until

the left upper jaw began to swell, the left eye was pushed up and forward, and the teeth became so loose and troublesome that they had to be removed. The swelling of the face proved to be greatly augmented by an apparently long-standing abscess in the antrum, the result of the death of a second molar many years before, the roots of which penetrated its floor. Upon the removal of this tooth a large

FIG. 15.

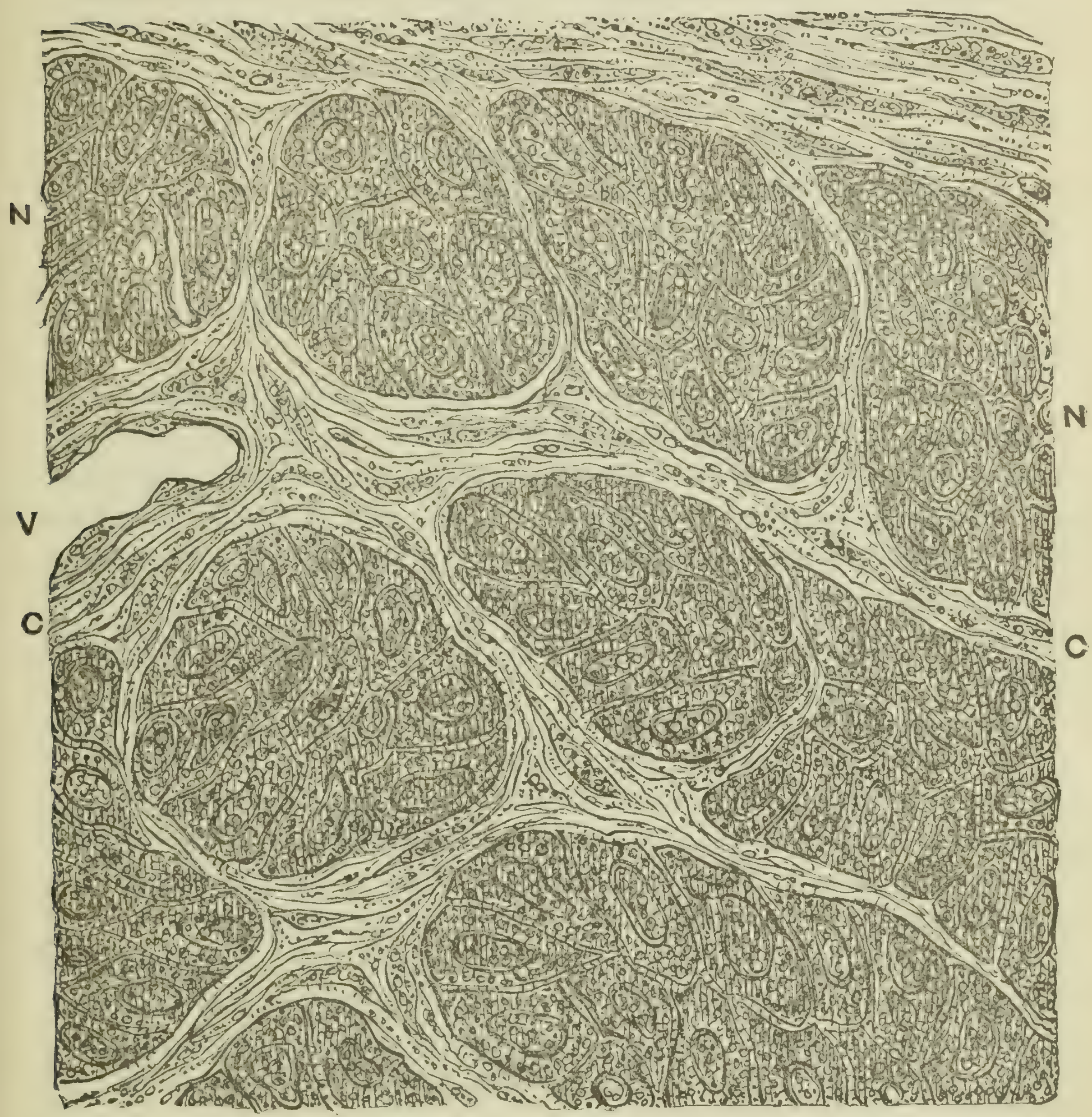


FIG. 15. Medullary Cancer of the Left Upper Jaw, invading the Alveolar Process and Gum. N, N, Nests of irregular polyhedral epithelia; C, C, Delicate fibrous connective tissue between the nests; V, Vein. $\times$ 600.

quantity of fetid pus escaped, and a temporary improvement was the result. Later the swelling invaded the front of the mouth and passed to the right side to such a degree that several operations were required to remove the fungoid, easily-bleeding masses of the alveolar process, gum, and hard palate, which were almost choking the patient. The purpose of these operations was not to remove the

cancer, but to prevent death from suffocation or starvation. This specimen is a type of medullary cancer. (See Fig. 15.)

The specimen exhibited in some places an almost unchanged stratified epithelium covering the papillæ of the gum. In other places the papillæ were much enlarged and flattened. Still further, the papillæ have entirely disappeared and the epithelial layer is considerably thinned, until at last the epithelium had disappeared, and an ulcerating cancer-tissue appeared upon the surface. In those places where the epithelial stratum of the gum appears thinned the deepest or columnar row of epithelia as well as the lower layers of cuboidal epithelia are absent, and are replaced by a medullary tissue of a myxomatous character, which has incidentally sprung from the previous epithelia. We feel the more confident of such change having taken place from the fact that at the border between the epithelial and medullary tissues the epithelial bodies themselves show a marked increase of living matter, and a gradual transformation into medullary corpuscles.

Close beneath the medullary layer nests of epithelia make their appearance, separated from one another by, first, medullary, and deeper down by a delicate fibrous connective tissue, which latter has evidently orginated from the former. We therefore maintain that a medullary tissue which arose from previous normal epithelia may change into fibrous connective tissue, and *vice versa*, that medullary tissue which arose from connective tissue may eventually be converted into epithelia of cancer.

The medullary nests are made up of very irregular bodies, which by pressure have assumed a polygonal form. In many instances a whole nest or a portion of it is made up of granular protoplasm, with nuclei scattered at regular intervals, without any intervening cement-substance. Where the latter is present in the shape of a narrow ledge, it is invariably pierced by delicate offshoots or thorns, interconnecting the single epithelial elements. The changes of the epithelia toward proliferation are much the same as in the epithelioma before described. The connective tissue shows a transformation into lymph-tissue to a great extent. Where it has retained its fibrous character it is scanty, separating the epithelial nests and carrying a large number of protoplasmic bodies. The blood-vessels running therein are scanty, and prevailingly capillaries and veins. The latter often show sinuous contours, and are replete with blood-corpuscles. As stated under the heading of epithelioma, the secret of the general and local contagiousness of cancer has never been unveiled, but is left for future discovery.

AN EXAMINATION OF THE PHYSICAL FORCES WITH REFERENCE TO THE GERM THEORY OF DECOMPOSITION AND DISEASE.

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(Read at the Nineteenth Anniversary of the First District Dental Society of the State of New York, Tuesday Afternoon, January 17, 1888.)

To THOSE who have earnestly pursued the subject of bacteriology experimentally, or have closely followed its literature without bias, a paper intended as an exposition of the correctness, in the main, of the views of the leading men in this field of research, and the harmony of these with the laws of the physical forces of nature, would at this date seem superfluous. But when any new field of research is opened, and facts before unknown are placed before the mind to be assimilated and harmonized with the theories of the past, hindrances seem inevitable. To many minds the new facts seem to conflict with known and well-tried laws of physics, and therefore the observations through which they have been developed are regarded by them as faulty. This leads to severe questioning of every step of progress; affords a needed check to conclusions hastily drawn, and the ready elimination of the errors of the over-sanguine enthusiast in any line of research. I regard this as well so long as the opposition to progressive work in any direction is based upon demonstrable facts. But when the opponents of any specific line of progress come to depend upon preconceived notions, or theories not physically demonstrable, or offer these as argument without attempt at demonstration, the effort merits the name of prejudice.

Still, it must be admitted that articles having as their object the discussion of the physical forces correlated to the germ theory of the decompositions and of disease have not been so numerous and far-reaching that the field has become even fairly well filled, or that the general mind of the profession has found a satisfactory resting-place in what, to most men, is looked upon as the new doctrine. In this there are many men, good, true, and intelligent, especially in the dental profession, who fail to shake off old dogmas and grasp the facts of decomposition by germs and apply them intelligently in their daily practice. And so long as this is the case discussions of a nature calculated to assist in the proper understanding and intelligent use of the facts developed are needed. Knowledge of whatever kind is a growth which must have its stages of development and come gradually to maturity in order to yield sound and healthy fruit. Facts seized upon and applied to practice without wise correlation with other facts with which they are associated in nature, may be likened to grain sown upon the dunghill, which

springs up with a rapid show of growth, but is blighted in its fruitage. Nature is a harmonious whole; and when some of her developments are held in abeyance, while others are over-active, monstrosities result. This is as true in the development of thought as in the development of the plant.

In the growth of our knowledge of the germ theory of the decompositions and of disease, under the leadership of Dr. Koch and his co-laborers, there has been a great tendency to the following of isolated facts, devoloped by direct experminent, in all of their written communications to the world. This, while it seems to have been necessary in the first instance, for the prevention of hasty assumptions, until a sufficient line of facts should be developed for scientific collation, has now been carried so far as to render mycology somewhat one-sided and dogmatic. While this course has been wisely intended to affect the suppression of too hastily formed conclusions, many of the less considerate devotees to this study have made wholesale assertions from time to time that have not been well sustained by the facts at their command. Such inconsiderate statements and claims have had the effect of diverting the confidence of many good and intelligent men from this subject, and they have lost the benefits which a more considerate study of it would have bestowed. Many have felt, and I think rightly, that it is doubtful if one whose mind is preoccupied in the search for the isolated facts of this subject is as well adapted to the scientific arrangement of its truths, and the enunciation of broad views and just conclusions as to their bearing as a whole, as he who has held the detail of collateral facts closely in view while making a close and unbiased study of the facts developed by the researches of others.

Yet it must be said that many of the criticisms of the work of mycologists have been both short-sighted and unjust. Just here I may be pardoned for recalling the opening paragraphs of Dr. Ferdinand Hueppe's report of his investigations of the souring of milk ("Mittheilungen aus dem Kaiserlichen Gesundheitsamte," 2 Band, Seite 309): "In this age of the investigation of nature's phenomena the notion that exact experiment alone is able to afford scientific knowledge is becoming more and more prevalent. Still it is only when the historic critic comes to the aid of the experimentalist, and these two wings of investigation are united in a common cause, that we reach a proper appreciation of the fact that the new acquisitions of careful experimental research can form but a link in the chain of scientific advancement. It is only by keeping the mind directed to the acquirements of the past that one can know that facts have not been developed previously that will throw a doubt over the best and most assured observances of apparent phenomena.

"Further, he who is immersed in experimental study, and whose eye has lost sight of the development of thought in a department in which he works, is easily led to over-value the facts he has discovered, or their import, and prematurely to regard them as settling important questions.

"On the other hand, we are not well treated when, without direct criticism, we are confronted from a pleasant distance with old volumes of still more ancient thought, and awarded righteousness only when the newer thought remains unquestioned.

"It is here that experiment with its pure facts, if with less cunning motive, causes us to remember that the more specialized modern methods of investigation have their proper place in the development of thought. To this, meddling historic investigations, which are often without any understanding of the needs of modern research, are often unjust."

Considerations such as have been suggested have led me to give much careful attention to collateral evidences of the truths being developed by mycological research, and especially to the comparison of the physical forces operative in this field with the same forces as operating in the general field of nature; and it is to these that I wish now to direct your attention, postponing for the time the consideration of special forms of microbes.

This earth is composed of a few simple elements, numbering sixty-nine in all. Of these, variously combined, all material things which we know are composed. The changes which we note in nature are wrought by variations in the compounds formed of these elements, through the acts of decomposition and recomposition, building and tearing down the results of the building. Chemical transformations are taking place everywhere. In winter the landscape is gray, the meadows are bare, and the trees are bare poles and boughs through which the winds of winter whistle and moan. In the spring-time the meadows are gradually covered with a coating of green grass and are besprinkled with many-colored flowers, and the trees are clothed with their bright foliage, which rustles in the mild breeze, humming an accompaniment to the songs of birds. Within a few more short months the spring-time freshness of the fields will give place to the more sombre hues of the harvest time. The tree that has bloomed in the spring will be loaded with ripened fruit. The green stems of the corn and wheat which have sprung from earth into the air will present the ripened grain. After this will come the beautiful, variegated tints of autumnal foliage, shading into brown, and the dropping of the leaves from the trees. The flowers have gone; the meadows are brown and dry. Again nature fades away into the gray of winter, and the cycle of another year has

been run. The year also presents its changes of temperature from the frosts of winter to the heat of summer and back again. Through these we get the snow and ice of winter, the thaws of spring, the heavy rains and floods of early summer, the droughts of the late summer and fall, grading back again into the snows of winter.

Nature moves in a continuous change of cycles, of which the seasons is the most prominent example. In this cycle of the seasons we recognize two distinctive features going hand-in-hand, moving together. One of them is purely physical, and is represented by thermal changes, storm and flood. The other, while none the less physical, is more than physical. They are changes which are occurring in the combinations, decompositions, and recompositions of the sixty-nine elements that form the sum-total of the material world, and in this sense are physical. Gray earth, air, and water take the form of the blades of grass, of the perfume of the full-blown rose, of the full-leaved forest, of the ripened wheat. Some of these again are changed into the bird that flits from bough to bough, the herds that roam the fields, the wild animal that lurks in the jungle, the fish that people the waters, the insects that are ever present about us. But all of these, all, each, like the seasons, runs its own little cycle, brilliant or sedate, and fades back again to earth, air, and water.

All of this presents an infinite array of chemical compositions, decompositions, and recompositions. These are under the control of and are dominated and directed by forces that are, in the main, unseen except by the mind of the searcher for the truths of science. What are the forces that underlie and control these changes, these chemistries, of the universe? One says, "They are all of the forces of the universe combined." Yes. But what are these forces? What is each individually? What is the function of each? What part is each playing in the ever-changing world about us?

It is to these especially that I wish now to call your attention, for our knowledge of these and of their interdependence must form the basis of scientific research. Perhaps every one here has, it may be unwittingly, but none the less certainly, formed his estimate of the germ theory of the decompositions and of disease in harmony with views he may have entertained as to the operation of certain forces. And all our future reasoning, based upon facts developed in our progress in the science of nature, will be colored and shaped by the ideas we may hold of the physical forces that underlie nature's phenomena. We should therefore classify and study them, and use our best endeavor to understand them individually and collectively. Perhaps no man can, at this day, give a classification that will meet the approbation of all. But an attempt may be made with the hope that it will call out others.

I should classify them under four heads or groups,—Attributives, Auxiliaries, Aggressives, and Directives.

Classification of the Forces.

1st Group—Attributives:
- Chemical Affinity,
- Gravity or Weight.

2d Group—Auxiliaries:
- Light,
- Heat,
- Electricity.

3d Group—Aggressives:
- Life.

4th Group—Directives:
- Mind,
- Creator.

Attributives.

The first group of these forces, affinity and gravity, are unfailing attributes of matter. There are no material elements that are destitute of them, but each possesses both chemical affinity and weight in distinctive form; and in each element these forces are as unchanging as the elements themselves. Indeed, each element is known by these attributes; for there is none other by which in the varying changes of composition and decomposition they can be recognized. Color might be regarded as an attribute, but so far as it pertains to the individual elements it may be obscured in their combinations. Form might be regarded as an attribute, and possibly it is, if we were capable of discerning it in the atom or molecule, but not being able to do this, the idea of form is worthless except as a hypothesis. Form may be an attribute of certain material things, as the man, the oak, the house; but as an attribute of matter it is not demonstrably invariable, and cannot serve as a distinguishing characteristic of any material element.

Chemical affinity is distinctly an attribute of matter, because under given conditions it is demonstrably invariable. Weight (another expression of gravitation) is also an attribute of matter, which under given conditions is demonstrably invariable. Both of these are essential to matter, for without them matter is not. They constitute the essential forces of matter, and are the attributes by which we recognize the simple elements. Chlorine is recognized as chlorine because it manifests the chemical affinities of chlorine. Sulphur is recognized as such because it presents the affinities of sulphur. Weight is an aggregating force; affinity is a combining force. The former brings the elements together; the latter mar-

ries them, and they bring forth compounds, and build the forms which we see around us. Weight is the aggregating force which has brought and which holds the material of the planet together; that holds the aggregated planet in its orbit; that prevents the molecules of which it is composed from flying asunder. Affinity controls the molecule, determines the interjoining of element with element for the formation of compounds, and the decomposing of compounds and recombining of the elements in other compounds. It acts only upon insensible portions of matter which we can recognize only in aggregations. Weight, gravity, acts through any distance, though diminishing with distance. Affinity acts by contact only; sensible distance nullifies it.

All of these attributes of matter are self-satisfying forces, in that the result of their action is to produce a condition of rest; a rest that is eternal in so far as these forces have power to initiate changes. The stone that has fallen and found a lodgment will remain lodged so long as its support is maintained. Gravitation has no power to change its position. It acts in one direction only. It is not a disturbing force. It acts only to bring together things that have been put asunder by other forces. Life overcomes the force of gravitation and builds the stalk of corn upward; the tree towers aloft; the bird skims through the air. Life departs, and the inert matter of which these are formed is brought to a resting-place on the earth by gravitation.

Chemical affinity, as has been said, acts only at insensible distances. Contact is a necessity. But this force has no power to bring about the contact. Matter acquires no power of self-movement by reason of chemical affinity. This attribute of matter is utterly inert until the conditions of its activity have been brought about by other forces. The one element must be presented to another before chemical affinity can act. Not only this, but they must be presented under certain conditions. Oxygen and potassium, when brought together, unite to form a base, or an alkaline oxide of potassium. This satisfies the affinities of the two elements, and action ceases. Sulphur and oxygen, when brought together under certain conditions as to heat and moisture, unite to form sulphuric acid. With this the affinities of the elements are satisfied, and there is no further change until something else is presented. Now, if the oxide of potassium be presented to the sulphuric acid, another combination occurs which results in the formation of a salt—potassium sulphate. The lesson to be taught here is the fact that each of these chemical changes occurs only after the elements are brought by other forces into position for the action of their chemical affinities. They are powerless to initiate movement. In this respect all other elements

exactly correspond with these. But when different forms of matter, or different elements or compounds of them, are brought into certain relations to each other by forces extraneous to themselves, these attributes become active until the new relations are satisfied. The potassic oxide will remain such to the end of time if not disturbed. The same is true of the acid. The salt will remain a salt to the end of time if not disturbed. The compounds of the element are no more self-moving than the simple element. This is as true of one compound as of another. An acid is quick to unite with many substances when presented to them, but has no power of seeking them, and is therefore powerless until moved by other forces than its own. This is as true of the most unstable compounds as of the most stable. An unstable compound, so called, is simply one that is easily decomposed by addition of some other element or compound, or by the action of some of the disturbing forces, as light, heat, electricity, or life. There are a few instances in which the chemical affinities so act that several compounds may be formed and decomposed one after another before a condition of complete satisfaction is obtained, or a permanent compound formed; and others of three or more elements, in which one by its presence causes the others to combine in such a manner that the reaction is spread over a considerable interval of time, so that during this period the affinities seem to be acting continuously. But it may be stated as a truism that any compound that is formed by the chemical affinities will be permanent, or will lead to permanency, if other forces do not interfere, and if new elements be not added. This statement covers all combinations, both organic and inorganic. That some are more easily disrupted, decomposed, or changed in their chemical arrangements than others, is of course recognized by every observer of the phenomena of nature.

Auxiliaries.

The forces of the second group, light, heat, and electricity, are properly auxiliaries to those of the first and third. They are not inherent in matter, and are not necessarily attributes of matter. The presence and existence of matter without them becomes a tenable hypothesis. Yet in a strict sense these cannot exist without matter, for the reason that they consist of forms of motion, and can become active only when operating through or upon matter.

These forces have peculiar powers over the physical condition of matter, and also modify the chemical affinities in a marked degree. They are disturbing forces. For instance, hydrogen and oxygen may be commingled without combining to form water, but an electric spark or a burning coal introduced causes an explosive combination.

Many combinations are formed by the excitation of the chemical affinities by heat. On the other hand, many decompositions are effected in a similar manner. Heat also affects the chemical affinities in a slower and less sensible way in an unlimited series of instances, and may be said to be a constant factor, both promoting and limiting the changes in nature by enhancing the activity of the affinities in some instances and curbing this activity in others; by causing elements to combine here and by preventing their combination there. It is also an important auxiliary to the life-force in building and tearing down the results of the building. All organic bodies are disrupted or changed in their chemical forms by high temperatures. The power of life to build is limited within the small range of about eighty-five degrees F., or between thirty-five and one hundred and twenty degrees. This statement should be qualifed, perhaps, by the recognition of the fact that certain forms of life have the power of an internal control of their own temperature, which has a remarkably wide range, and in this way become in a certain sense independent of their environment. Heat is therefore auxiliary to the life-force in all its forms.

Heat is also a large factor in promoting chemical phenomena by its power in another direction. Through its power over the physical condition of matter it becomes a disturber of gravitation and an active cause of motion. As has been said, every element and each compound has its own specific weight. Each of its atoms or molecules is drawn to the central mass of the earth by a specific power which is invariable. But by heat these atoms or molecules are caused to stand apart so as to lessen the weight of a specified bulk of matter in a wonderful degree. The best illustration of this is the conversion of water into the gaseous form or steam, in which, under the pressure of one atmosphere, its bulk is increased seventeen hundred times, which when bulk is considered lessens its relative weight or specific gravity in the same degree, and causes it to fly off into the atmosphere, in which it may remain indefinitely suspended in the form of condensed particles, as mist or cloud. This is again precipitated in the form of rain, snow, etc.

This, coupled with the motions caused by the varying temperature of the atmosphere, combined with those induced by the rotation of the earth on its axis, brings about our winds and gives rise to storm and flood, which are ever carrying the elements and compounds of them from place to place,—beating, mixing, pulverizing, and grinding element with element, compound with compound; decomposing the old and forming new; aiding the processes of the life-force on the one hand, giving us the stratified rocks on another, and contributing to the play of the chemical affinities in a multitude of ways that

cannot even be hinted at in a paper like this. Indeed, meteorology, though as yet but partially developed, is a study of the utmost importance when considered only with reference to life and health. But aside from this, it is one of the most fascinating of studies. It is here that we find the play of the forces that have made geology, that have formed the drift covering the original granite, that have formed the glacier, the morain, and the stratified rocks; and which have again and again swept away whole regions of these and reformed them in the untold ages of the past.

Light, another of the auxiliary forces, also affects the chemical affinities in definite directions, one of the most familiar of which is seen in the changes wrought in the photographer's plates. This power is widespread and far-reaching in its results, but far more limited than heat. In the doings of the life-force, though clearly auxiliary, it is to many of the forms of life indispensable. The chlorophyll of the plant, which gives color to the grass, to the foliage, and to the flowers, is not formed without this factor. Yet many plants and animals live without it, as is witnessed in the eyeless fish of the Mammoth Cave, and a multitude of vegetable forms.

As yet too little is known of electricity to properly classify its influence in the production of the phenomena of nature. It is well known that under artificial restraint and control it may be made to effect chemical changes readily; especially the resolving of compounds into their original elements. But what may be the extent of its action in the modification of the phenomena of nature, under normal conditions, is as yet a matter of conjecture.

Aggressives.

We now come to the consideration of the third group, which has but one member, life. Life, considered as a force acting upon matter, must be regarded as a principal factor in the production of the chemical changes apparent in the phenomena of nature. It is at once unique and distinctive, standing out and alone, and prominently; and yet blended with and making use of all the physical forces below it. In itself it presents nothing except a hidden power over the chemical affinities and the auxiliary forces. It is a power operating upon matter through the employment and control of its attributes. It becomes tangible to our senses only through the material forms which it builds, for otherwise than this we can form no conception of life. I have said repeatedly that the unaided action of the chemical affinities brings stability. The material forms constructed by them would remain until eternity if not disturbed by other forces or the addition of new elements. The crystal, once formed, would ever remain a crystal, for the reason that the chemical

processes are complete. Life is the opposite of this, in that its chemical processes are never complete until the cessation of life; and even then it has left the means of continuing these in other generations. It maintains a continuous presentation of element to element for the formation of new combinations. It is forever repeating, forever changing; nothing is permanent. If at rest apparently for a time, as in the form of the egg, the seed, or the more mature plant in winter garb, it breaks into fresh activity under fitting excitation by the auxiliary forces. The great tree rises toward the heavens only to die and fall back to the earth, but has yielded abundant posterity. The grass which is green to-day may be brown and dry to-morrow, but has provided for a new growth in days to come. The rose spreads its beautiful colors to the sunbeam, throws its perfume on the air, and withers away, but leaves the seed from which spring new generations.

Again, unlike the other forces of nature, life inaugurates the chemical changes which it induces. Instead of acting only when *brought* within range of material upon which to act, within certain limits it seeks out the materials. Instead of being compelled to wait for material to be brought together, it is active in bringing together its material. It is ever aggressive, active, and constant in its progress.

The attributes of physical life may be summed up under four propositions, which contain the essentials of the physiology of all its forms, no matter how high or how low in the scale, and without which there is no life. These I have made use of often before, but they are essential here, and I repeat them. They are:

First. The power to form a solvent or digestive agent that will prepare food-material for absorption and assimilation,—an enzyme, as diastase and the peptones.

Second. The power of the assimilation of the food-material thus prepared, or the power of tissue-building; of nutrition.

Third. The power of denutrition, or the shedding out of material once used in tissue-building, in the form of waste products; as carbonic acid, alcohols, urea, alkaloids, etc.

Fourth. The power of reproduction in a definite line of similar forms, or unlimited self-propagation. Of these the first three act by making use of the chemical affinities, through peculiar modes of presenting the elements to each other for the formation of the compounds of them essential to the life principle, and the building of the life-forms. The fourth includes all the rest.

The more we examine and the more we understand of physical life, the more accurately do we find these four propositions to express the essentials of its phenomena. They cover every form of life, from the man to the lowest microbe. None possess less, and

while many have complex variations of these, none have more. It is in these that we find the active nature of the life principle. If perchance there be some parasitic forms which assimilate the material prepared by their hosts without individual digestion, it does not invalidate the general proposition. But even these will be found to exercise this function under some of the conditions of their life.

Through the exercise of these functions life is ever aggressive. It seizes hold of matter and brings it under its dominion; makes use of it by weaving it into the chemical form of the fluids and tissues of which its physical forms are built, and then throws it aside in other chemical forms totally different from those in which it was found. Earth, air, and water become grass; but in the growth of the grass much of the material taken into the green blades is thrown out again in the form of various acids and gases. The antelope eats the grass, and the material of the grass becomes antelope. But much of the material is, during growth, thrown off as waste products, so that in the building of one antelope great quantities of grass are changed into other chemical forms. The lion eats the antelope, and the antelope becomes lion; but many antelopes are required for the building of one lion; for much of the material used passes back to the earth as waste.

Note particularly that it is only by the continuous use of the elements of earth, air, and water that the grass is grown. A specific weight of these will in no case produce an equal amount by weight of grass. A single ton of grass will in no case produce a ton of antelope. Neither will one hundred pounds of antelope eaten by the lion add one hundred pounds to his weight. Yet in each case the material is completely changed in its chemical forms. It may be true that in the growth of the grass much of the elements of earth, air, and water used falls back again to the simple elements of earth, air, and water, while only a portion is given back in other chemical forms. In the consumption of grass by the antelope none of the material is given back as grass. Some is given back as earth, air, and water; a large amount is converted into the fluids and secretions used in the physiological process of the animal or built into its tissues. But these do not remain. The fluids are excreted to give place to newly-formed compounds, and that built into tissue displaces almost the same amount of material which is shed out by the processes of denutrition. Indeed, after maturity of the antelope denutrition becomes equal weight by weight with nutrition. This material is not given back as grass or in the chemical forms of grass; not in flesh nor in the chemical forms of flesh, but in chemical forms differing entirely from these, and which are known as waste products. The same is true of the lion. Finally the lion dies, and in

the jungle there lies the carcass of the lion. Life has suddenly left the form it has built. The material form is no longer aggressive, no longer active. The power which presided over the functions of digestion, nutrition, and denutrition has ceased to act. The presentation of element to element for the breaking up of combinations and the formation of new has ceased, and the chemical processes are complete, as in the crystal. The physical form is there, the chemical form is there, but the life that controlled and continued the chemical processes is gone forever, and the chemical affinities are left alone and powerless. Life has not changed the attributes of the matter it has handled. The chemical affinities have at all times remained the same. Life has used these forces, not by changing their character or qualities, but by so controlling the presentation of element to element that the chemical affinities would by their normal action do its bidding. Here lies the secret of the power of life over matter.

Many of our great money kings have become rich, not by creating wealth themselves, but by exercising a certain mastery or control over men that do create wealth, and turning the labor of these to their own account. It is just so with life. It creates no affinities in matter. It changes no affinities of element for element. These are one and unchangeable forever. Life makes use of their power by so presenting element to element, molecule to molecule, that the chemical affinities will do its bidding.

Now, since life has left the carcass, these affinities are left to themselves. They are satisfied. Therefore, the carcass will remain a carcass to the end of time if not disturbed by forces extraneous to itself. Men have said, "The carcass spoils." I have said no, the carcass does not spoil; something spoils the carcass; and in this I am supported by recent developments in science brought about by the strictest experiments which the world has known, which have now been repeated and confirmed by careful men in all parts of the world for a generation. For ages the devotees of science had searched for the element that was active in the inauguration of chemical changes in that carcass, and formed theories in regard to it. Oxygen was thought to be active, but in 1838 Schwann, by admitting oxygen to sterilized meats, after filtering it through sulphuric acid, or passing it through red-hot tubes, proved that it was not active in that form of presentation; and in 1854 Schrœder stereotyped the proof by admitting air through sterilized cotton; and this mode of preserving sterilized culture media has become the custom of all mycologists. The debates between Pasteur and Bastian seem to have definitely settled the question of the power of the elements, unaided by other than their attributes and the auxiliary forces, to set in motion

changes other than those which bring stability. Science knows no spontaneous origin of life, and the forces below life have not the power of spontaneous action, nor of movements which perpetuate themselves. Were it otherwise, spontaneous generation, or the beginnings of life from matter, would certainly become a possibility. Liebig's theory of molecular motion as an element in the spoiling of the carcass, and as an explanation of the decomposition, fermentation, putrefaction, and rotting, has become a myth of the past.

Therefore, the carcass that lies in the jungle is a bunch of combinations of elements that are as powerless to inaugurate changes as the sands of Sahara. Then how is it that it disappears from the earth? The grass sprang from gray earth, air, and water in accordance with the powers exercised by a germ wafted to the spot by the atmospheric currents. The antelope found its food in the grass, and the grass was changed into other chemical forms. The lion found its food in the antelope, and the flesh of the antelope was changed into other chemical forms. And now microbes find their food in the carcass of the lion, and the carcass of the lion is changed into other chemical forms. These have their powers of digestion, assimilation, denutrition, or the formation of waste products and reproduction in a definite line of similar forms the same as the grass, the antelope, and the lion. These germs are wafted to the spot by the same atmospheric currents that plant other seed in favorable soil. They grow and produce similar changes in chemical compounds, and by the physiological acts of these the carcass of the lion is spoiled. Its chemical elements are disrupted and sent out upon the air as gases, pass back to earth as fluids, or are built into the life-forms of these lowly organisms to be shed out as waste products peculiar to the individual species. The bodies of the first microbes are consumed by others, and these again by others, until the bleached bones only show where the carcass of the lion once lay. In this we have the theory of decomposition by germs in its completeness and simplicity. It is the simple work of life repeated from form to form, the one destroying that which has been built by the other, world without end.

Directives.

Mind is a director of life so far as physical things are concerned. It is most developed in the higher forms of animal life, especially in man. It serves to control environments and takes advantage of surroundings for the aid of, and the perpetuation of, life. In this sense it is truly auxiliary to life in the sense of directing movements. Perhaps there is a higher sense in which life is auxiliary to mind, but I will not now discuss these propositions.

The creative power which has brought these laws into operation and maintained them is God.

This group has been added for the sake of completeness, rather than for discussion.

I have now made what is perhaps a sufficient review of the physical forces in their relation to each other in the production of the phenomena of nature, so far as they pertain to decomposition by germs. It will be seen by all, I think, that this is in the most perfect harmony with other natural phenomena, and really that there is no other plan known to science by which such decompositions could occur. Of course there are forms of decomposition and recomposition that are entirely independent of the life-force. Under the influence of moisture and thermal changes, freeze and thaw, rocks are pulverized and their detritus carried by storm and flood to be commingled with other elements and compounds for the formation of new combinations. Water is nature's great solvent, and with the varying phases of storm and flood salts are dissolved here and carried there, producing changes, and much of the material built up by the different forms of life may finally be dissolved and carried away to be mingled with other compounds, and thus aid in the production of other chemical changes. Dry air desiccates the dead carcass, the succulent herb, or even the hardest wood, and the characters of these are more or less changed. But we get no change from these causes which are comparable with those which we know as putrefaction, fermentation, or rotting. These terms were introduced and in general use long before the true character of the processes which they represent was understood; and their significance has been in some degree lost in their present usage. Originally fermentation was applied to those processes of decomposition accompanied by the liberation of gas which bubbled up through a liquid, without reference to other characteristics of the process. Putrefaction was applied to those forms of decomposition accompanied by foul smells. Rotting was applied somewhat indiscriminately, but more especially to those forms of decomposition which proceeded in solids or semi-solids; as the rotting of wood, or the rotting of fruit. In recent times many seem to have made an effort to convert these terms into more specific uses, which has caused no little confusion, since different writers have not construed them alike. Therefore, I cannot favor their continued use in any other sense than that of describing the most superficial appearances of the processes of decomposition. These processes are all one and the same in the same sense that animal life is one and the same, or in the same sense that vegetable life is one and the same. These may be divided into many species,

based upon certain obvious characteristics, or especially in some of the lower forms large enough for microscopic observation, upon characteristics not so directly obvious, but such as are discovered only by the skilled botanist. Now, when we descend to the more minute microbes, this division into species becomes correspondingly difficult, and their differences are not obvious to any but the expert, except when the characters of the decompositions affected by them are widely divergent. Hence, these terms only serve to confuse if used in other than their original and popular signification.

In the meantime the study of the special characters of microbes and their physiology has gone steadily forward. This work has necessarily been prosecuted very differently from the study of the higher plants or of animal life. The physical or morphological character of the individual microbe has been held less important than the effects of the growth upon the substratum in which it has grown, while in the study of the higher plants the morphological characters have been the principal points of study. It has therefore opened up a field of study that had not, in other forms of life, been even fairly well tilled. The pepsin of the stomach of the animal had long been known, however. It had been isolated and its powers of digestion when separated from the living organism determined. The same had been done with the diastase from sprouting grain, and botanists have discovered that the rootlets of plants were able to extract substances from the soil that were not soluble in water, or any substance contained in the earth ; and Sachs had shown by direct experiment upon polished marble that the rootlets of plants were capable of furnishing a substance that would dissolve away the surface of the solid stone in a preparation of pabulum for the growing plant. Mycologists have not been less successful. The yeast-plant has long ago been shown to eliminate a diastase that digests cane-sugar, the must of grapes, etc., as a preparation for assimilation. Miller has determined the same thing for the micro-organisms of dental caries, and other men have determined the digestive agents of so large a number of other microbes that we are justified in assuming that the possession of this power is the general law of micro-organisms, as it is the law of the higher forms of life.

The fact of nutrition or tissue-building is completely shown by the existence of the living forms, and requires no discussion. It is not necessary, however, to suppose every particle of the substances decomposed passes into the form of the tissue of microbes, any more than it is necessary to hold that every particle of the food eaten by the animal is actually converted into the tissue of that animal, which we know is not the case. It has been proven in many cases that one portion of a particular compound culture medium is em-

ployed by a certain microbe while another is left. In this way compounds may be decomposed partially by one species while another may employ another part; or one part may be appropriated while another remains to be used only after the first is wholly destroyed, etc.

But a considerable portion of food-material is converted into the tissues of these microscopic plants. Anyone who will grow vigorous micro-organisms in a light broth and afterwards collect and desiccate the plant grown, and desiccate the specimen of the pure broth equal in amount to that used by the plant, and compare the residue from each, will be surprised by the amount of matter converted into tissue; especially when it is remembered that in this growth waste products are continually being displaced from the growing tissue, and when these processes are further compared with the consumption of food-material and growth in the animal kingdom.

Waste products of microbes are analogous to the waste products of the other forms of life. In a large proportion of cases these are active poisons. They are always poisonous to the form of life that produced them, if they exceed certain proportions. These are, for animal life, urea and allied compounds and gases; for vegetable life, the vegetable acids, alkaloids, alcohols, and gases; for microbes, sepsin, ptomaines, acids, alkaloids, alcohols, and gases. It is to these principally that the injurious effects of microbes are due. They may produce evil results in a number of different ways. Many are comparatively harmless, but others are active poisons. Some may cause local irritation and inflammation; others suppuration; others have been shown to be absorbed into the blood and cause specific forms of fever, while still others may affect prominently the nervous system, as in the production of tetanus. In other words, microbes produce disease by producing substances by their physiological processes of growth which are injurious to health. Very many forms are found to be harmless, while others are found to be dangerous in the highest degree. Indeed, the greater number of microbes are purely saprophitic,—that is to say, they grow in dead matter only. A fewer number are found to be parasitic, or capable of growing in the juices of the living tissues, and producing their characteristic chemical changes in these fluids, and thus elaborating poisons.

That this is the true explanation, in brief, of the decomposition and the production of disease by germs seems no longer to admit of doubt. There are many factors in the nature and growth of these lowly organisms, and the chemical changes which they induce, yet to be discovered. But enough has been learned in the fifty years that have elapsed since the discovery of the yeast-plant by Schwann

for the formulation of these general statements. Within this time those theories which stood opposed to the germ theory have gradually disappeared from our literature; and now there is no other plan known to science by which these decompositions could occur. The theory of Liebig approached more nearly to this than any other that has been formulated, and has had more influence over the minds of men than any other view entertained, and it is this view that has been the great antagonist of the germ theory. From the time of Schwann there has been no other that could stand in discussion before learned men for a moment, unless it has been the simple "I don't think so," uttered with a shake of the head. Liebig's theory I have quoted time and again in the discussion of the various phases of this subject. In effect he held that the molecules of decomposable substances took upon themselves peculiar forms of motion, which continued until each molecule fell into other and simpler compounds. That is to say, a molecule composed of a large number of simple elements would, on account of this molecular activity, be divided into two, three, four or more molecules, each composed of one, two or more of the elements of the original molecule, and thus the complex compound would be broken up into several more simple ones. This molecular motion was supposed to be of different varieties, corresponding to the different fermentations and putrefactions, but all agreeing in their general mode of action. These were also able, according to Liebig, to reproduce themselves by communicating their own motions to the molecules of decomposable substances with which they might come in contact, and thus putrescent diseases became contagious by inoculation with putrescent matter. These molecular motions were supposed to be active in compound gases as well as in fluids and solids. Even particles of putrescent matter that had been thoroughly dried might again become active when moistened, and communicate their form of motion to substances which before had been sound and free from taint, or communicate disease. Also, he held it proven by experiments that the boiling temperature would destroy these molecular motions.

It will be seen that in this theory there existed a curious parallelism with the theory of decomposition by microbes, since the same plans of sterilization and protection from contamination were supposed to succeed as well in the one as in the other, especially after putrescent gaseous substances were eliminated by the experiments of Schrœder, in 1854, and acknowledged by the great chemist. The contention between these two theories was then reduced to actual tests of the possibility of the production of the decompositions without the presence of microbes. For many years microscopic inquiry was unable to cope with this proposition, for the reason that the

very minute and non-motile varieties of microbes were not demonstrable, and to many the molecular motion theory seemed to have the advantage. But as microscopes were improved, and the plans of detection by the later methods of staining were rendered more perfect, it was gradually demonstrated that none of the decompositions can be effected except in the presence of living organisms. This does not include, of course, those substances produced ordinarily by decomposition, but which we have learned to produce by purely chemical means, by synthesis. In this way urea, several alkaloids, and other of the waste products of living things have been produced in the chemical laboratory without the direct aid of life, but by processes that do not resemble the natural decompositions. This controversy was carried on principally between Liebig and Pasteur, and can be followed in their debates. It has now almost entirely disappeared from our literature, and can be found only in old publications. Since the time of Liebig no great man has especially championed his views, and these have dropped almost out of sight, though a review of the literature with a knowledge of what had gone before will show that some of the great men of Europe and of America still held to this view until within a few years. Now we may say that it has entirely disappeared, and the only opposition to the germ theory of the decompositions and of disease is seen in the ominous shake of the head and the "I don't think so," and a sealing conviction that as a matter of course decomposable substances simply fall into other chemical forms as time passes, but without any apparent reasoning in regard to the matter, or a seeming thought that every effect must have an underlying cause.

This is the most dangerous form of skepticism with which professional men can be afflicted, and in case of the germ theory of decomposition and of disease is doing infinite damage to the progress of the profession.

Conclusion.

And now, in conclusion, I wish to appeal to each and every one to make a closer study of the practical aspects of the germ theory of the decompositions and of disease in its bearing upon our daily practice.

It belongs to the dental profession to push this phase of practical inquiry to its utmost limits of usefulness. There is yet a wide field to be explored, and much labor is necessary in its exploration. Leber and Rottenstein made what was practically the beginning in 1868. Miles and Underwood did some good preparatory work. Dr. Miller, in his work on fermentation in the human mouth, made the first really practical discoveries, and placed the etiology of dental

caries on solid ground. I have, in "Formation of Poisons by Micro-organisms," by articles, and by cultivations before societies, done something to familiarize many in the profession with the microbes of the mouth and the processes of culture, thus bringing them into closer relations with the subject both theoretically and in its practical bearings. There have also been occasional articles from other sources, but it seems to me that it is safe to say that we are lagging behind the medical profession in the development of this subject. This matter is not for the few who may especially consider themselves students of nature. It contains stubborn practical facts for every man in the practice of dentistry. It should not be expected that every man should lay aside his excavation and go to cultivating microbes, but it does belong to the dental profession to push forward discovery in this field until the microbes habitually in the human mouth have each become well known to us, and the innocence or the dangers of each have become known to intelligent practitioners. Each of our schools should take this matter up in a practical way, and familiarize the young men coming into the profession with the ways and means of prosecuting the work. No one or two, nor even a dozen, men can do this work satisfactorily. It must grow slowly and through the observation of the many united in a common cause. This is not a thing to be studied simply as an accomplishment, nor a thing to be looked into simply on account of any novelty that it may present to the individual. The new factors presented are simply extentions of our knowledge of the forms of life beyond those which were before known or recognized, and with these the extension of known principles of physiology to forms of life before unknown. While some facts in the physiological processes of life are differently correlated in the lower organisms, no factor is essentially changed in its nature. Every man among us lives by changes wrought in the chemical constituents of his environment. The air of the room in which we have met is rapidly losing uncombined oxygen and gaining carbon dioxide; each one among us is daily producing changes in quantities of chemical compounds known as food-material and giving it back to the material world in chemical forms wholly changed. The microbe is doing no more, and is doing no less. You might as well expect one hundred men to breathe the air of a confined space without contaminating it as to expect a myriad of microbes to live in your saliva without changing its qualities. You might as well expect to live on food without changing its chemical qualities as to expect a myriad of microbes to live in a carcass without changing the chemical qualities of the flesh of that carcass.

Then look again at our materia medica. From whence does it come? Some remedies are from the mineral world, it is true; but a

very large majority are the direct results of life processes. Look among the extracts from the plants, and see what a long list. Look among the alkaloids, and see what a long list. Look among the vegetable acids, and see what a long list. All of these have been elaborated from earth, air, and water, and prepared for us, primarily, by the processes of life. Look again as to the qualities of these, and see what a long list of poisons it contains; see what a long list of plants develop chemical combinations that are poisonous to animal life. Then look again at the long lists of microbes already discovered. Is it singular that some of these should, in the play of their physiological processes, develop chemical compounds that are inimical to the health of your patients or yourselves? Look again at the fact that a long list of these have well demonstrated qualities of growing within the juices and the flesh of our patients, and especially of forcing their way into any chance wound. Is it to be supposed that they may grow in such positions without causing characteristic changes in the chemical composition of their environment? If it has been ascertained by careful observation that some of these produce changes that are comparatively harmless, must we suppose from that fact that all must be harmless? Must we suppose that because the vegetables that grow in the garden are good and wholesome, are devoid of poisonous properties, that no plant develops poisonous properties? The knowledge we have gathered of the properties of plants has long ago forced us to adopt a different view. Have we any reason to suppose that, as we descend to the lower order of plant life, the physiological processes in the different orders of these should be more constant, or that they should less frequently present us with chemical compounds that are dangerous, even though these compounds be elaborated from the juices from our own flesh or that of our patients? If not, then the subject merits our closest study in its scientific aspects; demands our most careful attention in its practical aspects, in the interests of humanity, trusting to us to conserve health, and life, and usefulness; and to neglect this is to neglect a duty that we as professional men are pledged to perform.

STUDIES OF PYORRHEA ALVEOLARIS.

BY M. L. RHEIN, M.D., D.D.S., NEW YORK, N. Y.

(Read before the First District Dental Society of the State of New York, at its Nineteenth Anniversary, January 18, 1888.)

Of all subjects in dental pathology none have more interest for the scientific practitioner of to-day than, first, the problem from whence comes this fell disease; second, how shall we combat its insidious encroachments?

While much remains for the careful and patient investigator to learn, we can safely assert that the paper of the evening, with its admirable illustrations of scientific research, has cleared up some of the etiology of this disease. Our nomenclature on this subject is very defective, and Dr. Black's efforts to classify the various forms of disease of the peridental membrane, while being a step in the proper direction, do not cover the ground, but leave a very interesting field open for future work. My experience with this trouble leads me to heartily agree with our revered teacher, Dr. Atkinson, when he illustrates to us how this disease is due "to lack of nourishment in the elemental corpuscles of the tissues and the return to the indifferent condition or embryonal state of the tissue elements;" or in broad terms to constitutional causes.

Dr. Black, one of our authorities on this subject, under his classification of phagedenic pericementitis, maintains stoutly that this disease is purely local. It is granted that many forms of the disease appear where none but local causes can be found, but the history of numerous cases, showing its alleviation or *quasi* cure, depending on the improvement of some vital trouble, the recurrence of which inevitably brings back the original state of pyorrhea alveolaris, would tend greatly to strengthen our view that some of these cases are merely symptoms of constitutional trouble. The gums and peridental membrane being fed by about the most remote portion of the blood tracts, it is no more than reasonable to suppose that these organs should be the first to exhibit symptoms of a lack of nourishment in their elemental corpuscles.

There is no better instructor than accurately noted clinical data. For this purpose I will cite the facts in one especially marked case. Mrs. S., married; age about thirty-five; had two children. After the death of one child the intense grief and suffering of the mother necessitated her seeking medical advice, when she was found to be suffering from heart trouble, and extensive fatty degeneration around the pericardium soon appeared. From a thin and spare figure she soon developed into a very robust appearance, gaining enormously in flesh. Neuralgic pains in her gums caused her physician to send her to me, February 7, 1887. She had a beautiful set of teeth; occlusion perfect; the amount of calculous deposit was very slight, and at first sight the gums appeared to be in a healthy condition. Pressure, however, soon displayed the presence of pus in copious quantities, and, on exploring underneath the gum, pockets were discovered extending beyond the dental ligament. There were present no serumal deposits, but a rapid liquefaction of the tissues seemed to be in progress. The symptoms, very likely due to the recent date of the commencement of the disease, yielded readily to the following simple

treatment: Injections of mercuric bichloride in solution of hydrogen peroxide, followed by the application of carbolic acid and potassium, more commonly known as the Robinson paste. This application caused much pain, but by February 25 the gums were in a healthy condition. About four weeks later she returned suffering from a recurrence of the painful symptoms. She had been taking the very best of hygienic care of her mouth in the meantime. She then told me that by the advice of her physicians she was about to go to Europe to take the Marienbad bath-cure for her heart trouble. When she left New York, about the middle of April, her mouth was again in a healthy condition. After giving her the addresses of several foreign practitioners, I informed her that if her heart trouble was benefited she would experience no need for dental services. Her course of treatment benefited her so much that she was like another person when I saw her on her return this past autumn. Her teeth had just commenced to trouble her when she first began to experience the benefits of the cure; from that time she had no more oral trouble, and when she returned there was no sign of pyorrhea present. A few weeks ago I saw her, and her heart trouble was again becoming predominant, with the first recurrent symptoms of pyorrhea since her treatment in Europe. It yielded readily to treatment. She intends returning to the Marienbad baths in the spring for further treatment.

It matters not so very much if we are correct or not as to our knowledge of the etiology. To cure the disease is the thing as far as we are concerned in our daily practice; whether the disease is purely local or only the symptom of some hidden trouble, our treatment depends upon local remedies for its successful issue. A new case of pyorrhea the veriest tyro can relieve; but the old chronic forms, where the pockets have advanced half way or three-quarters to the apices of the roots; where the teeth are distorted, and so loose that they are almost ready to tumble out of their sockets,—these are the cases that try dentists' souls. The main difficulty in these aggravated cases, where the spark of vitality still remains undimmed about the apices of the roots, is the *how* to return them to their natural condition and retain them in a comfortable state? The means recommended for this purpose have been the binding-wire and the silk ligature. Of the two I prefer the ligature, as the less yielding, when properly adjusted. Both means are objectionable except as temporary expedients, on account of uncleanliness, discomfort, and for many other reasons, and when teeth must be retained firmly in position for years in order to preserve them some other measure must be adopted to secure satisfactory results. I had the good fortune to treat such a case recently, and with such marked beneficial results

that a recital of the facts of the case cannot fail to interest you all, and perhaps instruct some.

July 9, 1887, Mr. H., aged about fifty-five, presented himself to me at the request of his physician to see if his inferior teeth could be preserved. He had come to his physician for a tonic preparatory to having all of his inferior teeth extracted, which his dentist assured him was absolutely necessary. His mouth presented the following condition:

In the inferior maxilla the right first and third molars and left first bicuspid and first molar were missing. There was present the most distressing condition of pyorrhea. The pus-pockets were so deep that later I found two of them extending around the apices of the roots; the gums were so hypertrophied and inflamed as to present the color of ruby, and the slightest pressure sent forth copious

Fig. 1. Fig. 2.

Fig. 3.

quantities of pus. There was no salivary calculus present, but serumal deposits extending to the depth of each pocket. The effects of this disease had caused the central incisors to separate fully a half-inch, so that he was wearing this plate (Fig. 1), with a tooth placed between the central incisors to fill up the space. The result of this spreading of the teeth, as you can readily perceive, was to throw all of the anterior teeth out of the arch. They were so loose that it was impossible to apply any form of instrument for the removal of the deposits; the act of brushing was torture to him.

In the superior maxilla the second bicuspid and first molar on either side were missing, and with the exception of some pyorrhea around the third molars the remainder of the teeth were in a healthy condition. My prognosis was not very favorable. I told the patient that treatment alone would reveal to us whether any of the teeth were in a hopeless condition. On July 19 he placed himself under my care, and I at once tied together the eight anterior teeth, from the right second bicuspid to the left cuspid inclusive, using a strand of waxed dental floss crossed four times. By this means they were held firmly

in position while undergoing treatment, and the space between the teeth in the median line was gradually lessened, the ligature being renewed at intervals as this space decreased in extent. The removal of the serumal deposits was then commenced. On July 22, after removing large portions of deposits from the anterior roots of the second inferior right molar, I found the grain-like deposits as well as the pocket extending around the apex, in consequence of which

FIG. 4.

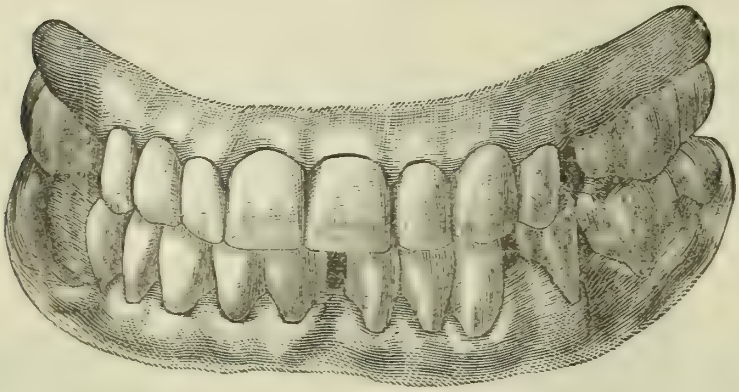
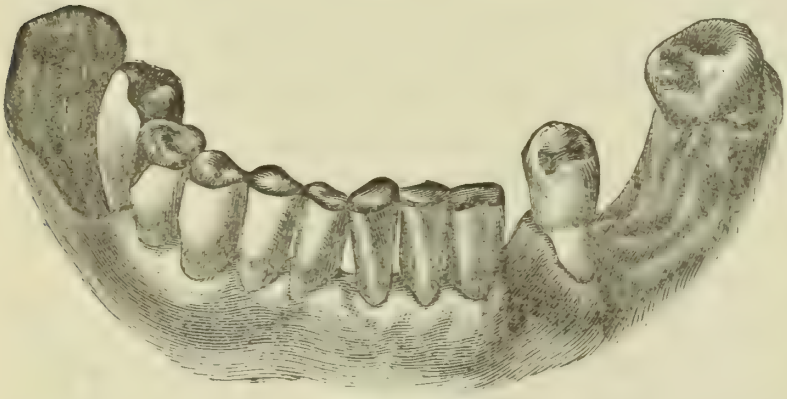


FIG. 5.

I removed the tooth, which I now pass around (Fig. 2). July 26 and 29, treatment of the gums continued by washing out with solution of mercuric bichloride in hydrogen peroxide, followed by the application of potassium and carbolic-acid paste. On the last date the first impression of the mouth was taken (Fig. 3). This shows the hypertrophied condition much improved, but the ugly deformity caused by the separation of the teeth in the median line is still strikingly exhibited. Absence from the city was the cause of my not seeing the patient until August 12, when the peridental tissues were all found to be in a much healthier condition. At this time the left inferior second molar was found to be in the same condition as the right one had been, but at the earnest solicitation of the patient extraction was deferred for the present. Treatment progressed to September, the inferior anterior teeth being drawn gradually closer together and inside of the superior ones. In the early part of September ten days' absence from the city again intervened, but on September 16 the impression of cast 3 (Fig. 4) was taken, which shows a marked improvement. The patient had become so imbued

FIG. 6.



with the hope of saving his teeth that it was not until October 13 that he consented to the removal of the left inferior second molar (Fig. 5), which on close inspection will show where the scaler scraped around the apex of the root. On retying them on October 18 the teeth were all found to be back in their normal positions. Treatment of a stimulating nature was then kept up, but the question now arose what means should be adopted to retain them permanently in position. All forms of ligation were objectionable. An artificial plate that would firmly secure the loose teeth in position, and at the same time replace the lost organs, was thought of, but all forms were found to be impracticable. I finally adopted the suggestion of my associate, Dr. C. L. Andrews, to unite the eight anterior teeth together by means of gold fillings through their cutting edges. On November 8, after applying the rubber-dam over the eight anterior teeth, without disturbing the ligature, a groove was cut through the cutting surfaces as wide as possible and about one-eighth of an inch in depth. The first right bicuspid, having a large cavity on its posterior approximal surface, was contoured with gold up to the groove, and soft

Fig. 7.

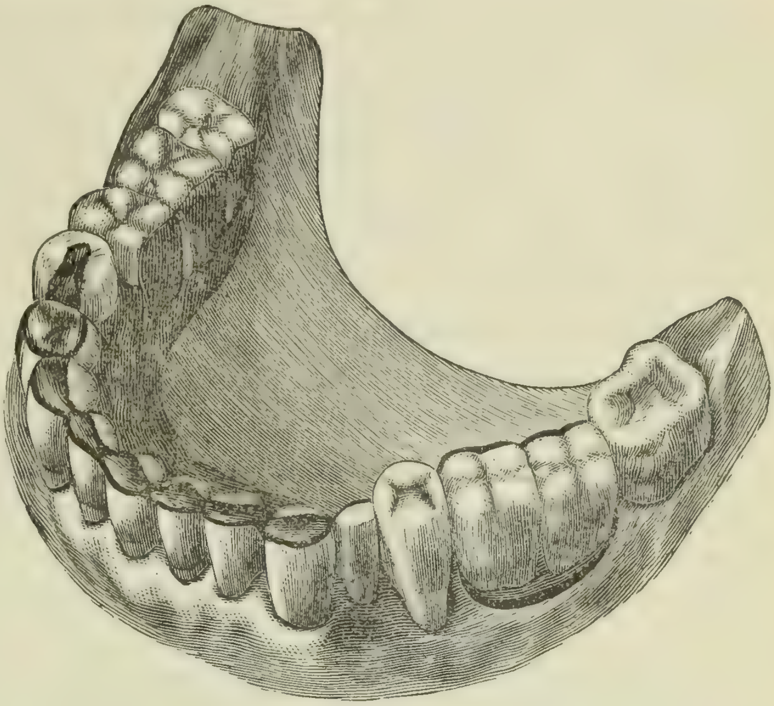
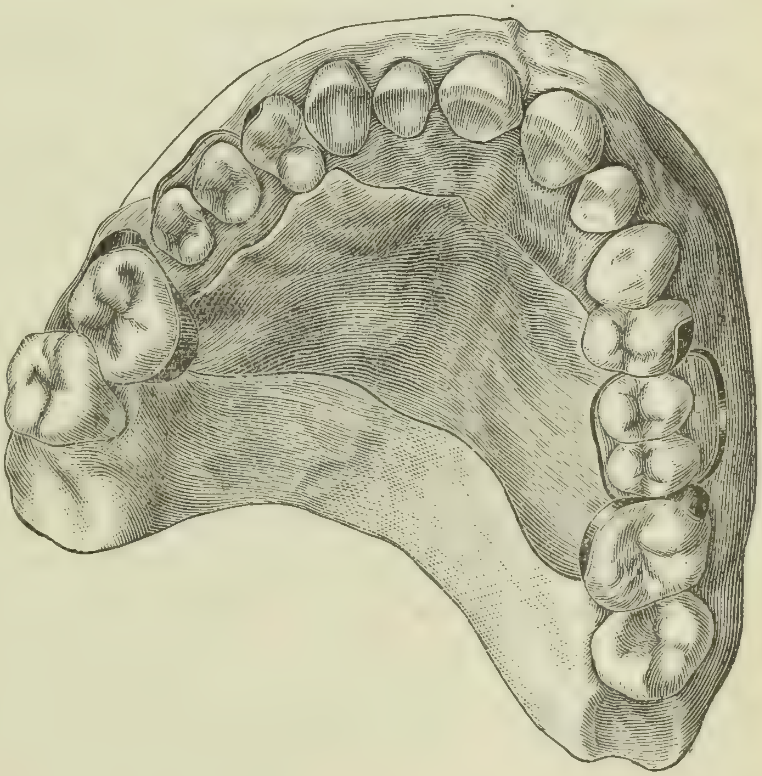


Fig. 8.



gutta-percha placed in the groove. On November 15 the operation was performed, which is shown on cast 4 (Fig. 6). The rubber-dam having been adjusted, in addition to the ligatures, oxyphosphate was pressed around the teeth to hold them more securely, and some of it placed between the teeth to use as a floor to carry the gold from one tooth to the other. Gold foil was then carried from the left cuspid all the way around to the second right bicuspid, in an even manner, packing it with the electro-magnetic mallet. After malleting half of it, a very small-gauge gold wire was placed in the center, so as to leave the splint in the form of a hollow gold tube. The finish was made of gold and platinum, in order to enable the splint to better withstand the effects of mastication. Later, artificial teeth were constructed to supply the places of the missing organs, so that at present the mouth presents the appearance shown in the articulated casts 5 (Figs. 7 and 8).

The gentleman who has had the courage to undergo this operation is present with us this evening, and has kindly consented to allow an inspection of his mouth to be made at the close of this meeting.

PROCEEDINGS OF DENTAL SOCIETIES.

NINTH INTERNATIONAL MEDICAL CONGRESS.—SECTION XVIII. DENTAL AND ORAL SURGERY.

(Continued from page 77.)

Fifth Day—*Evening Session.*

The Section met pursuant to adjournment, Vice-President W. W. H. Thackston in the chair.

Dr. A. H. Thompson, Topeka, Kansas, read a paper entitled "Does Function Control the Evolution of Structure?" Dr. Thompson quoted from a paper by Dr. C. N. Peirce, in which the ground was taken that the evolution of function cannot be isolated from the evolution of organs, so nearly do they develop together by the process of adaptation. Adaptation to environment may be called the ancestor of function as function is of organization. If life consists of inner actions adjusted to balance outer actions, and if every advance is the effecting of a better adjustment of inner to outer actions, it follows that from the beginning function is the determining cause of structure.

A century ago Lamarck laid down his laws with regard to the development of organic life, which we can change but little: "The production of a new organ in an animal body results from the supervention of a new want continuing to make itself felt, and a new

movement which this want gives rise to and encourages. The development of new organs and their force of action are constantly in ratio to the employment of these organs; all that has been acquired, laid down, or changed in the organization of individuals in the course of their life is conserved by generation and transmitted to new individuals which proceed from those which have undergone the changes."

No other organs so fully illustrate the influence that function has exercised in modifying form as does the masticating apparatus. The adaptation of the teeth and jaws to the work they are intended to perform is so exact that they are the most valuable diagnostic medium to the naturalist. On the teeth alone have been founded the stories of the lives of many species of animals that have lived and died in the great geological past. It is most essential that the structure and adaptation of the teeth should be highly specialized, for upon their adaptation to the food employed depends the life of the species.

All life depends, first of all, upon the food-supply for existence and continuance; and the ability to utilize that food is the first required function of existence. Variations of the quantity or quality of food have caused more or less modification of all the forms that have ever lived on the earth. The importance then of what might properly be called food-selection as a potent modifying influence cannot be over-estimated. It necessitates perfect adaptation of the organs that procure, reduce, digest, and assimilate food that the species may live. Slight changes will cause gradual alteration of organs that there may be perfect adaptation to new conditions. Great changes, as to an entirely new food and sudden withdrawal of the old, cause extinction of life through incapacity for sudden readaptation to new conditions. Almost any species can tolerate slight alterations in its food, and persistence in that direction will surely bring about a corresponding modification of the food-reducing organs. This necessarily compels function to control and modify structure. The laws of development are governed, if at all, by the purposes for which development takes place. Organs are not evolved to await a function; tools are not made before their uses are discovered. Everything is made for a purpose, and the purpose must precede the thing made for effecting the purpose. The means for accomplishing an end are not the cause of creation but the effect; the organ is the effect and function the cause of structure.

The masticating region is the most variable of the entire organism, and is peculiarly susceptible to influences inducing change. The history of the origin and evolution of the teeth throughout the animal kingdom shows that they were developed merely for the

protection of the skin of the jaw and the rendering of greater effectiveness in the manipulation of food. Specialization then began, and from elementary forms of teeth which afforded the rudest protection to the gum-tissue of the jaw, all subsequent and higher forms were progressively evolved and elaborated as required by the different foods of the different species. Thus, as mastication was developed from a simple to a complex function, the organs for performing it were correspondingly developed in simple obedience to new demands. Like other dermal structures, the teeth can be altered in form and numbers and the species continue to exercise all the functions of life. Rudiments remaining in the jaw illustrate this, where teeth have been suppressed through disuse and the masticating area reduced or its whole character changed by changed habits concerning food.

Some years since the writer devoted a series of papers to the elucidation of the fact that mastication was passing into disuse, and that the teeth of man are, as a consequence, in obedience to well-known laws, in process of suppression. If function is the cause and support of structure, if an organ develops or atrophies as it is used or disused, if the impulse of active employment dictates the evolution of parts and tissues in succeeding generations, if organs are suppressed through disuse or remain as mere rudiments, then must the teeth of man be tending toward final and inevitable suppression; unless a higher civilization and education brings about an artificial cultivation of the habit of mastication, by which the teeth may be improved and developed by exercise and use, as the muscles of the lungs are improved and developed. If the natural function of the teeth is to be superseded by the artificial reduction of food, if the habit of disuse is to persist and if organs do atrophy from disuse, if the structure of the teeth is to become weaker and weaker because of the withdrawal of the creative stimulus of active exercise and they thereby become more susceptible to disease, if the teeth are already disappearing by the frequent suppression of certain of the series (as the wisdom-teeth and occasionally the laterals), then is the suppression of the teeth of civilized man in progress to-day. The question is, if the function disappears can the organ persist?

Dr. W. H. Atkinson, New York, thought the paper a series of assumptions without anything behind them to tell what is function. The relation of an organ to its use seemed to the speaker to be that of antecedent and consequent. Is not the mammalian lung prepared before there is any air in it? It is well known that the best test in cases of supposed infanticide of the new-born is to cut out a piece of the lung of the infant and place it in water; if it sinks there has never been air in it, and the child was consequently still-

born. Our naturalists have failed to distinguish what is life and what is death; what is form and what is function; and to apprehend that there is a purpose, a use, behind it all. The physiology of the mineral is crystalline; of the vegetable cellular; of the animal corpuscular dilation. An amœba performs every function of mammalian life, so far as its own needs are concerned. It rejects from the same point at which it takes in,—bouches and debouches from the same point. It feels without nerve, it moves without muscle, it digests without digestive apparatus, except momentarily. What is the example given? The development of the lungs and muscles by exercise. When we contemplate respiration and study its phenomena thoroughly we will have a comprehension of a function that will knock out any piece of mere machinery on this planet.

Dr. Thompson. Nevertheless function is the cause of structure.

(To be Continued.)

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

The regular meeting of the Odontological Society of Pennsylvania was held Saturday evening, December 3, 1887, at Justi's rooms, Thirteenth and Arch streets, Philadelphia.

The President, Dr. Edward C. Kirk, in the chair.

Dr. Daniel Neall McQuillen, chairman of the Clinic Committee, reported as follows:

There was a very large attendance this afternoon at the clinic, held in the rooms of The S. S. White Dental Mfg. Co., Chestnut street, corner of Twelfth.

Dr. C. N. Peirce filled by hand-pressure a crown cavity in a lower right second molar under water with semi-cohesive foil (Globe No. 4), using large cylinders and finishing with foil folded in the form of tape. The gold was placed in a dish filled with water, and the cavity was repeatedly syringed in order to keep it free from saliva. Dr. Peirce does not advocate this method, but wished to demonstrate the practicability of such an operation where it is impossible to keep the teeth thoroughly dry. . . . Dr. E. C. Kirk performed Dr. W. J. Younger's operation of implantation upon three patients. The first case was that of a young man for whom a right superior first bicuspid was implanted. The missing tooth had been extracted about two years previously. The second case was that of a young lady for whom a left superior lateral incisor was implanted. The missing tooth in this case had been out for nearly three years. The third case was that of a young man whose left superior first bicuspid had been removed three years ago. In each case Dr. Kirk used a fifty

per cent. solution of cocaïne hydrochlorate, two or three drops of which were used hypodermically over the site of the socket. The effect was to so benumb the parts that in two cases the operation was performed painlessly, and in the third, where there was not sufficient time given for the cocaïne to act, there was slight pain. Dr. Kirk deviated somewhat from the method of operating as pursued by Dr. Younger in discarding the trephine and using a spear-pointed drill, to make the perforation for the socket, which was enlarged and formed by large, coarse, slightly-tapering fissure-burs. The time occupied in performing the operations was from ten to twenty-five minutes. He also showed a cuspid implanted October 29, which had become perfectly firm, and was giving great satisfaction to the patient. . . . Dr. E. T. Starr exhibited the Knapp blowpipe and demonstrated its use; also, showed the method of making articulating caps for gold crowns, with dies of very hard phosphor-bronze, and hubs composed of tin and lead, by which a perfect reproduction of the grinding surface of molars and bicuspids is obtained.

The following paper was read by I. N. Broomell, D.D.S., of Philadelphia, Pa., upon

Prosthetic Appliances.

I have selected this subject simply because it is one to which I have always given especial attention and study, and within the limits of which, if there be any limits to its possibilities, we are enabled to attain the highest degree of professional skill, as well as to extend unbounded benefits to our patients. In no other branch of our profession is there such a field for advancement, for on every hand we have continually presented opportunities for the class of work which I shall attempt to describe.

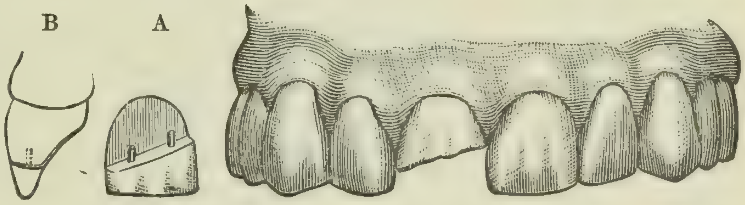
Some thirty or forty years ago mechanical dentistry formed the principal portion of dental practice; but with the introduction of vulcanite (which material, by the way, has contributed largely to the lowering of the professional standard, and to the advancement of quackery) the thoughts of the skilled members of the profession were turned toward operative work, or the preservation of the natural organs by fillings. This was undoubtedly a step in the right direction, and rapid progress was made. In fact, the advancement was so pronounced that many teeth were lost by indiscriminate attempts at preservation by filling. I remember that at about the time I entered the profession, in 1877–78, there existed what might have been appropriately termed a "filling craze." All teeth were to be restored or saved by filling, and very little consideration was given to their condition. Patients would sit for hours to permit the

tedious operation of the introduction of great amounts of gold, in the vain attempt to permanently restore the missing crown of a molar. In fact, so marked were the preferences for operative work, that the indications pointed to a speedy separation of the two branches; but this change, fortunately, did not take place, nor is it now likely to occur. The advances made in prosthetic appliances in the last few years have placed this branch of our profession in fully as exalted a position as have the most brilliant filling operations, and I think that extremely carious teeth will be saved in the future by mechanical means rather than by filling them.

Of the few appliances to which I shall call your attention, the majority of them were inserted under circumstances wherein gold fillings are generally resorted to in attempts to restore the lost structures.

The first case was one which presented some difficult features, but also furnished a favorable opportunity for mechanical restoration. The patient was a young lady who had been unfortunate enough to fracture the right superior central incisor, so that the lower third, or about three-sixteenths of an inch of the cutting edge, was missing. (Fig. 1.) The pulp retained its vitality, and the surrounding tissues were in a healthy condition. The accident had occurred probably two years or more previous to her coming under my care. In the meantime she had called on several dentists, and they all recommended either the devitalizing of the pulp and building down with gold, or excision and crowning in the ordinary manner. The patient would consent to neither of these operations. Upon examination I determined to place a porcelain tip on the tooth without occasioning the loss of the pulp. I prepared the tooth by grinding the broken edge to a smooth, even surface. I then took an impression of the parts, being particular to secure a perfect representation of the palatal surface. After making a zinc die, I swaged a base plate to accurately fit the palatal surface of the broken incisor. I used platinum for the base plate, on account of its easy adaptation, and also with the idea that it would be, in combination with pure gold for solder, less liable to interfere with the natural translucency of the tooth. In selecting a suitable tooth from which to form the tip I experienced considerable difficulty, but finally succeeded in securing one with the pins low down, and having the labial surface the exact conformable contour. This latter detail is of great importance in operations of this nature, for, if one is compelled to

FIG. 1.



grind the finished surface of the porcelain, the result will be far from satisfactory. The remainder of the operation was accomplished with the patient in the chair, as it would be difficult to make such appliances with any degree of certainty from the plaster model. Taking a small drill, a trifle larger than would admit No. 26 wire, I proceeded to drill the retaining-pits, or holes, as they should be called in this case. These I drilled on either side of the pulp, and parallel with it, to the depth probably of an eighth of an inch. Drilling the holes in the base plate to correspond with those in the tooth, I adjusted the pins and soldered them to the base plate. I considered this preferable to first securing the pins in the natural tooth and afterwards attempting to fasten the base plate to them by splitting the pins, and filling around them with gold or amalgam. After making as perfect a joint as possible between the porcelain and natural tooth, it was backed and soldered to the base plate in the ordinary manner (A, Fig. 1), and the appliance secured in position with oxyphosphate cement (B, Fig. 1).

The next case was one in which the superior cuspid was fully a quarter of an inch out of line; standing inside the arch to such a degree that a casual glance at the patient would lead one to suppose the tooth was missing. It was also imperfectly developed, so that, had age and other circumstances favored its restoration to the proper position in the arch, its malformation made it inadvisable to attempt such an operation. (Fig. 2.) The patient being desirous of having the deformity remedied, at least so far as appearances were concerned, I proceeded to do so in the following manner: Grinding off the irregular prominences of the tooth, I made it more perfectly conical in shape. After securing an impression of the deformed tooth and casting zinc dies, I swaged a hollow gold cap to accurately cover the whole surface and extend slightly under the gum. This added thickness of gold, when placed over the tooth, extended the labial surface to about what should have been the palatal line; thus permitting me to adjust by grinding and filing a porcelain tooth with its backing to the cap. These were soldered together and the appliance secured on the cuspid by oxyphosphate cement. In this case no pins were used, the cap alone being sufficient to hold the denture in position. (A, Fig. 2.) It has now been in the mouth some three or four years, during which time I have removed it several times in order to be satisfied that all was right under the cap. In fact, I consider that, when it is at all possible to do so, all appliances of this order, including small pieces of bridge-work, should be so constructed that they may be removed from time to time, thus affording an opportunity to detect any carious conditions.

Another case, to which I shall briefly call your attention, was somewhat similar in construction to the one just described, but was inserted under different circumstances. For some reason unknown to the patient, he had lost from a lower incisor the entire labial surface, extending from the cutting edge to the gum-margin, and somewhat below it. The lingual half of the crown remained, and fortunately the pulp was not exposed. (Fig. 3.) With a corundum wheel I ground off the cutting edge of the tooth (to the horizontal dotted line seen in Fig. 3) until it was below the line of the pins in the porcelain tooth, which had been selected because its cross pins were near its cutting edge, and ground the porcelain tooth to fit the inclined surface of the natural organ. I then fitted a backing of very thin platinum, allowing it to extend over the whole back of the porcelain tooth, including the inclined surface. After making a cap to perfectly fit the lingual surface of the incisor, I pressed it around the sides until I could solder it to the backing, thus making a cap (A, Fig. 3) which completely covered the abraded tooth. Oxyphosphate cement was also used in setting this denture. For anchoring the majority of appliances of this nature, I consider the zinc-phospates in one form or another far superior to gutta-percha or amalgam. My unsuccessful experience with gutta-percha has caused me to abandon its use in most cases. For, unless you have the piece to be applied very warm, so much so that you cannot handle it to properly adjust it, the gutta-percha is more or less liable to roll up, and the moment it chills to the slightest degree further adjustment is impossible, and generally the hardening takes place before there is sufficient overflow, and consequently the appliance is not (to use a familiar term) perfectly "sent home." Amalgam in such cases as I have described would of course be out of the question; but in setting crowns of whatever nature it is certainly a most objectionable material to employ. Therefore I prefer a good quality of oxyphosphate cement, properly mixed,—and when I say properly mixed I think I have given all requisite directions, as the variations in temperature, and also the proportionate quantities of the com-

Fig. 2.

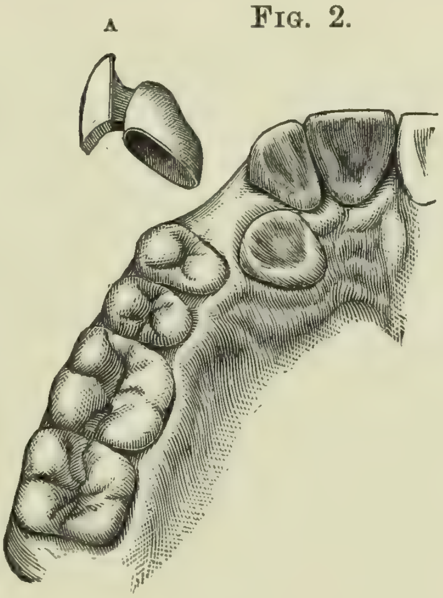
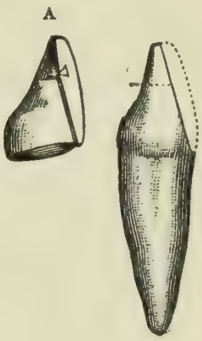


Fig. 3.



bining substances, make it impracticable to give further details in this direction.

[The remainder of Dr. Broomell's paper was devoted to a consideration of some more usual methods of crown and bridge-work, which want of space compels us to omit.—Ed. DENTAL COSMOS.]

Discussion.

Dr. Bennett. I am pleased with the paper. The limitations of filling were reached ten years ago, when many of the profession ran wild over large gold contours and restorations, some of which involved the entire crowns of the teeth. Dr. Webb and others showed what could be done in this direction, often at an expenditure of time, strength, and money that was not justified by the results. Experience has demonstrated the limitations of gold restorations, and shown the necessity for the exercise of good judgment as well as of skill. Neither fillings nor houses can long endure when built on chalk or sand.

I propose some months later to read a paper on crowns, and to give, as far as may be, points from my practice, and suggestions gleaned from the experience of others. I will try to show then that gutta-percha, which the essayist seems to condemn, is a most valuable material in crown-work, and can be used to good purpose in some of the cases described in the paper just read.

In my practice I try to follow these two rules: never fill a frail discolored front tooth, and never destroy a pulp to anchor to a crown, unless as in some cases a tooth standing alone becomes the abutment of a bridge. I therefore decidedly indorse Dr. Broomell's method of attaching the porcelain tip and facing respectively of the upper and lower front incisors. And I do not think any better plan could be devised for the cuspid. As to the bicuspid and molar, neither being vital, I should cut them off and put on Logan crowns. I need not mention bridge-work, as my views are doubtless well-known, but I do not wish anyone to suppose that I think the ferrule crown the best for all cases. Much as this crown is needed in bridges, a porcelain crown is much better on many roots. The cap-crown is the thing for badly-decayed vital teeth, and it can be used generally as far forward as the second bicuspid. It is hard to apply when the neck of the tooth is small, and not being sightly, it should not be used in exposed positions.

Dr. James Truman. I have listened to the paper with much interest, but it is on a subject that I am practically not very familiar with. As I view the first operation delineated, it seems to me that the anchorage would not be sufficient for the support of the partial crown placed on the tooth. I have heretofore made use of the ordinary plan of building down with gold foil, and in some cases,

as I presume is the case here, where it was impossible to depend on a cavity for support, I have built around gold screws with much satisfaction. In one case that I recall the patient has been masticating on an incisor, built down in this way, for the past ten years. Perhaps the plan suggested by the essayist is to be preferred.

I still must object to the indiscriminate use of bands around the necks of teeth. I am well aware that it is said that trouble only comes to careless workers, and this is in part true, but it is just this class that needs the warning. The past week has brought me a case illustrating the folly of intrusting this mode of inserting teeth to careless hands.

I cannot become enthusiastic over bridge-work. It may be very useful in some cases; but serious objections to its use still remain, and I do not see how they are to be overcome. Have we the right to create bad breaths? Is it possible to avoid it in these cases? This is a question of paramount importance, and yet it is generally thrust aside as of no moment. There certainly will be in the not far distant future a great revulsion of professional sentiment in this matter.

Dr. Register. I am pleased with the practical bearing of the paper, and it impresses me that in dental practice, as in all things else, extremes meet. The prosthetic branch joins hands with the operative, and where one has failed at the expense of excessive labor and loss of nervous energy in its performance, success is attained through the unity of both. The operation of replacing fractured portions of the teeth with porcelain might well be called esthetic, for while it aims at preservation of the broken organ, it also aims to restore both natural color and contour. I have restored two cases of this character with fair success, each time taking an impression of the parts and having the porcelain faces made to meet the exigencies of the case.

The other cases referred to are of daily occurrence in practice, and in the light of present advancement, crowning, in my judgment, would be indicated here. In the case where the bicuspid stands well inside the arch I would devitalize, cut close to the gum, and, using a ferrule and tongue, bring the teeth into line by the artificial crown. In cases where my patients have reached middle life, I do not hesitate to devitalize *any* tooth, when in my deliberate judgment I think the result is of so great a benefit as to call for the sacrifice. Isolated, loose teeth, for instance, that in the ordinary vicissitudes of use would be at the minimum, I feel sure are raised to average usefulness by devitalization and bridging. They support each other and devitalization gives renewed energy to the pericementum. This assertion applies to teeth more or less affected by pyorrhea. In reply to Dr. Truman, in doing bridge-work differently, you know I

always advocated the use of a saddle lying upon the gum, the attachments being made, as a rule, with alloy rotated into juxtaposition. This method I have been following for fully twelve years. The early part of my practice was very crude, and was taken from my preceptor, Dr. Bing. In later years I changed the practice materially, using the saddle and making the teeth of such a shape that in case of accident they can be easily replaced without removal of the fixture. I have shown Dr. Truman a very difficult case, where two bridges were used to prevent the inferior oral teeth cutting into the superior palatal gum surface, and restoring the masticating surface. Another case, of a German who takes little or no care of his teeth, I showed to our present chairman, Dr. Kirk. These cases all rest on the gum, and yet the tissues are healthy, the functions of the jaws are restored, and the breath is as agreeable as it would be without the fixture.

Dr. James Truman. The case shown me by Dr. Register was certainly one of the most remarkable cases of bridge-work I have yet seen. The articulation presented difficulties not easily surmounted by any ordinary plate, and in this case bridge-work was certainly not only justifiable, but the only thing possible short of extracting the entire remaining teeth.

Adjourned. AMBLER TEES, D.D.S.,
Recording Secretary.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

THE First District Dental Society of the State of New York held a regular monthly meeting Tuesday evening, January 3, 1888, in the rooms of The S. S. White Dental Manufacturing Co., Broadway and Thirty-second street.

The president, Dr. W. W. Walker, in the chair.

Dr. C. S. W. Baldwin, of the Clinic Committee, made the following report of the afternoon's clinic:

CLINIC REPORT.

Owing to the great attractions offered for the coming anniversary, the clinic opened for 1888 with a smaller number present than on any similar occasion during last year, there being about sixty-five members of the profession present. . . . Dr. W. H. Atkinson was present with a patient for whom he had implanted a tooth two weeks before, which operation he will more fully explain. . . . Dr. C. S. W. Baldwin, of New York, and Dr. Deems, of Jersey City, exhibited ingots of copper amalgam of their make. Dr. Baldwin showed a tooth filled with it out of the mouth; also, made

comparison between copper and Lawrence's amalgam in the mouth. The hardness and edge-strength were much in favor of the copper, but Lawrence's was not so dark in color. . . . Dr. E. T. Starr, of Philadelphia, demonstrated with the Detroit electric motor, which has an open circuit and six cells connected with a switch-board having a treadle enabling the operator to couple any number up to six cells at will. The battery and motor are more fully described in the January number of the DENTAL COSMOS. The demonstration was definite and forcible, producing satisfactory results. . . . Dr. Heller, of New York, showed casts of the mouth of a woman forty years of age, whose superior maxilla had an exaggerated protrusion of the upper front teeth, which it was believed might be overcome by suitable dentures to supply the missing posterior teeth and separate the jaws. . . . Dr. B. A. R. Ottolengui directed attention to a pair of lower molars having triple roots, which he had filled with amalgam.

Dr. W. H. Atkinson supplemented the report of the Clinic Committee with the following remarks:

Dr. Atkinson. Two weeks ago last Thursday I implanted a superior incisor in the left inferior incisor socket. The space had increased so as to make it necessary to use a larger tooth than the one that normally belonged in that place. It had been the subject of pyorrhea alveolaris for many years, and finally became very loose, no alveolar plate being left on the anterior portion whatever, and very little gum. I determined to remove it. I selected a tooth with a root of sufficiently increased size to enable me to cut beyond the line of diseased action; and I was fortunate in getting the socket just large enough to admit of the tooth being driven in and held firmly in its position; the anterior aspect of the gum being whitened by stretching it and driving out the circulation in the blood-tracts. The tooth was a little sore the second day, but there was no inflammation, and there has been no discharge from that day to this. It will be three weeks next Thursday since it was put in. It is in the mouth of a lawyer, who needs clear speech very much. His left superior lateral is bare to the end of the root on the anterior aspect, as a result of the same trouble, but it has been controlled so as to be in useful condition. The implanted tooth is quite firm to pressure from the front backward, but has not strength enough to resist pressure from the inside forward, because of the lack of sufficient attachment. I feel certain that it has become attached, and the prospect is very favorable.

[Dr. W. Storer How, of Philadelphia, read a paper entitled "Professional Fees," which was followed by an address on the same subject by Dr. W. H. Atkinson. These we are compelled to omit because

of the space required for the transactions of the anniversary meeting of the society, which occured in the same month.—Ed. DENTAL COSMOS.]

Adjourned. B. C. NASH, D.D.S., *Secretary.*

SOUTHERN ILLINOIS DENTAL SOCIETY.

THE second annual meeting of the Southern Illinois Dental Society will be held in Centralia, on Tuesday and Wednesday, April 10 and 11, 1888.

A good programme is promised, and we urge especially Southern Illinois brethren to be on hand. A cordial invitation is extended to the profession in general.

G. W. ENTSMINGER, *Secretary*, Carbondale, Ill.

VERMONT STATE DENTAL SOCIETY.

THE regular annual meeting of the Vermont State Dental Society will take place at St. Johnsbury, commencing on the third Wednesday (21st) of March, 1888. The sessions will continue three days.

The Board of Examiners will meet on Thursday (22d) at 9 A. M.

Free return checks may be had on all railroads, and reduced rates at the hotels. All dentists are cordially invited to attend.

T. MOUND, *Secretary*, Rutland, Vt.

ALABAMA DENTAL ASSOCIATION.

THE next meeting of the Alabama Dental Association will be held at Selma, Ala., commencing on Tuesday, April 10, 1888, the sessions to continue for four days.

All dentists are cordially invited to be present.

T. M. ALLEN, D.D.S., *Secretary*, Birmingham, Ala.

UNIVERSITY OF CALIFORNIA—COLLEGE OF DENTISTRY.

THE exercises of the sixth annual commencement of the College of Dentistry of the University of California were held at Odd Fellows' Hall, San Francisco, Cal., November 9, 1887, at 8 o'clock P. M.

The address for the faculty was delivered by L. L. Dunbar, D.D.S.

The degree of D.D.S was conferred upon the members of the graduating class by E. S. Holden, LL.D., president of the university.

The number of matriculates for the session was thirty-six.

The following is the graduating class:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
Edward Livingston Davis	California.	Arthur Theo. Regensburger	California.
Joseph Dupuy Hodgen	California.	George Frederick Rodden	California.
Harold McKean Jones	California.	George Walter Rodolph	California.
Edward Maldonado	Nevada.	Granville Eugene Shuey	California.
Robert Eugene Payne	California.	Jennie Martha Simpson	California.
Charles Edgar Post	California.	Otto Frank Westphal	California.

ILLINOIS STATE DENTAL SOCIETY.

The twenty-fourth annual meeting of the Illinois State Dental Society will be held at Cairo, beginning Tuesday, May 8, 1888, the sessions to continue for four days.

An excellent programme has been arranged, with clinics as a special feature. A cordial invitation is extended to the profession to be present.

GARRETT NEWKIRK, *Secretary*,
1558 Wabash Ave., Chicago.

EDITORIAL.

PERMANENT ENLARGEMENT OF THE DENTAL COSMOS.

For the last two years we have each month been confronted with the problem of finding space in the DENTAL COSMOS for the valuable material presenting for publication, and have been forced, very much against our inclination, to omit papers and reports which we would gladly have accepted. The pressure has at last become so great that we have been compelled to make a permanent enlargement by the addition of sixteen pages to each issue. Beginning with this number, we shall hereafter present eighty pages of text monthly,—a gratuitous gift to our subscribers.

Such an increase, with a subscription price of only $2.50 per annum, suggests with added emphasis the question, How can a dentist afford to do without the DENTAL COSMOS?

FIRST DISTRICT ANNIVERSARY.

The nineteenth anniversary meeting of the First District Dental Society of the State of New York was held in New York City on the 16th, 17th, and 18th of January. Its varied and extensive programme was almost literally realized; a fact which is a creditable testimonial to the ability and energy of the president and executive committee of this famous organization.

Such of the papers as room can be made for will appear in the DENTAL COSMOS. It is sufficient to say that they reflect honor alike upon their authors and upon the society.

The clinical operations and demonstrations of instrumental appliances were exceptionally interesting and instructive, and were so numerous and diversified that the attention of every observer was sure of reward for the time and trouble expended in attendance upon the meeting.

Invitations to the number of two thousand had been addressed to

individual practitioners all over the country, and there were present not less than six hundred dentists, comprising such a proportion of the leading men in the profession that the assemblage was of a decidedly national character.

The value of such gatherings in advancing the best interests of the profession is beyond all question. It is safe to say that the impetus thus given to the various departments of scientific research, practical processes, useful inventions, adjunctive appliances, medicinal formulæ, and manipulative proficiency tends to the advancement of the profession in usefulness, self-respect, and public regard. Not the least of the good done will be manifest in the professional fellowships and friendships following such meetings. In view of all these resultant benefits, we are cordial in our commendations of all concerned in this notable anniversary.

LOUISIANA STATE DENTAL SOCIETY.

The tenth annual meeting of this promising society was held in New Orleans, February 15, 16, and 17, 1888. Its programme embraced essays and clinics by many prominent Southern operators: we regret its non-reception in time for publication in the February Dental Cosmos. The meetings were held in the Hall of Tulane University, the president of which with several of its professors delivered addresses and otherwise participated in the proceedings, which were of a very interesting and creditable character, and largely attended by dentists from all parts of the South; a result measurably influenced by the nearly simultaneous occurrence of Mardi-Gras festivities. We have space for no more than this brief mention of the meeting.

BIBLIOGRAPHICAL.

Irregularities of the Teeth, and their Treatment. By Eugene S. Talbot, M.D., D.D.S., professor of dental surgery in the Woman's Medical College, and lecturer on dental pathology and surgery in Rush Medical College, Chicago. With 152 illustrations. Octavo, pp. 163. Philadelphia: P. Blakiston, Son & Co., 1888. Price, cloth, $2.00.

Dr. Talbot has endeavored, in these one hundred and sixty-three pages, containing one hundred and fifty-two illustrations, to methodically set forth the history and corrective treatment of the principal types of irregularities in the arrangement of the human teeth.

Part I contains a brief description of the anatomy of the max-

illæ and teeth, and then shows the normal relations of these to each other. The etiology of dental irregularities next receives elucidation, followed by a description of acquired, hereditary, and casual misplacements, embracing also a consideration of prognathism and irregularities of the teeth of idiots.

In part II the author considers the treatment of dental irregularities by modes and means that are minutely described and depicted, so that the student or practitioner has thus portrayed a great variety of practical devices, designed for adaptation to every class of cases commonly presented for correction; while the principles involved in the operations are so set forth that extraordinary cases can be met by the exercise of ingenuity in applying the principles illustrated. Appliances devised by the author are presented, along with those of Drs. Patrick, Farrar, Byrnes, Coffin, Guilford, Matteson, Kingsley, Allan, Richardson, and Magill, and are shown in position on the teeth by suitable cuts.

Nothing is more certain than the fact that for the successful practice of orthodontia one should be thoroughly familiar with all available means and methods, to the literature of which this work of Dr. Talbot is a timely contribution. A suitable index facilitates reference, and the publishers have brought out the book in their customary excellent style, on fine, thick paper, and in superior cloth binding.

Note-Book for Dental Students (Dental Anatomy and Physiology). By James Rymer, L.D.S. Eng., M.R.C.S. London: J. & A. Churchill, 1888.

This little work of only sixty-seven pages contains the cardinal points of dental anatomy, succinctly stated, and will be valuable to the dental student, and as well to the post-graduate who would keep in mind the fundamental characteristics of the human teeth. Their comparative anatomy is a prominent feature of the work, which is highly commendable, notwithstanding that exceptions will doubless be taken to some points of detail by physiologists on this side of the water.

The Evolution of Immortality, or Suggestions of an Individual Immortality based upon our Organic and Life History. By C. T. Stockwell. 12 mo, pp. 69. Chicago: Charles H. Kerr & Co., 1887. Price, $1.00; may be obtained of the publishers or by addressing the author at Springfield, Mass.

It is with unalloyed pleasure that attention is here directed to this volume, which in sixty-nine pages embraces an amount of research and reflection that indicates a carefulness and competency

of consideration commensurate with the importance of the subject.

The lucid style, orderly arrangement, clear conceptions, mental grasp, skillful analysis, and logically synthetical deductions of the author are admirable. Dr. Stockwell is an acute observer and an accurate recorder of the vital phenomena which in his view inclose and disclose the fact that man is immortal. The simplicity and felicity of his phrases are equalled only by the modesty of his style in presenting the profoundest themes, in language free from dogmatism, contention, or obscurity. Seldom has a subject had an expositor at once so clear and so concise.

The relations of biology to dentistry are immediate, and it is therefore germane to the scope and function of a dental journal that this very creditable biological essay by a dentist should be brought to the notice of our readers.

Beecher's Dental Directory of the United States. M. P. Beecher, compiler. Octavo, cloth, pp. 196. New York: Beecher & Co., publishers, 1888.

This volume contains lists of dentists, dental colleges, and dental publications in the United States, and also a list of dental manufacturers and dealers. The compiler claims that it has been carefully revised and corrected, but such examination as we have been able to give it reveals many inaccuracies.

Transactions of the College of Physicians of Philadelphia. Third Series; Volume IX. Philadelphia: Printed for the College, and for sale by P. Blakiston, Son & Co., 1887.

This is one of the most bulky and important of the volumes of transactions issued by the time-honored College of Physicians,—commemorating, as it does, the centennial of the existence of the college with an elaborate account of its institution; giving the long roll of its fellows from the beginning to the present time, with dates of their births and deaths, and the institutions and societies to which they were or are attached; the addresses at the centennial anniversary, and the responses at the annual banquet; memoirs of Drs. Edward Hartshorne, Albert Holmes Smith, Squier Littell, and a biographical sketch of Dr. Austin Flint. The volume also contains seventeen papers (some of them illustrated) read before the college from July, 1886, to June, 1887, inclusive, with the discussions which followed their reading.

OBITUARY.

JAMES S. FRANKLIN, M.D., D.D.S.

Died, at Los Angeles, Cal., January 12, 1888, Dr. James S. Franklin, in the thirty-fourth year of his age.

Dr. Franklin was born in Obion county, Tenn., December 20, 1854. He received his literary education at the school of the Jesuits at Santa Clara, Cal., where he won many medals, including one for "morals, obedience, and general application,"—the first and highest the college conferred. He graduated with the highest honors of his class. In 1880 he graduated from the Philadelphia Dental College; in 1881 he received the degree of M.D. from the Jefferson Medical College of Philadelphia. After his graduation in dentistry he served as demonstrator of operative dentistry in the Philadelphia Dental College.

In 1883 Dr. Franklin located in Nashville for the practice of his profession, and won for himself a prominent position as an operator. In 1884 he was elected to the demonstratorship in the Department of Dentistry of Vanderbilt University, and at the close of the session received the honorary degree of D.D.S. He was a member of the Tennessee State Dental Association and of the Southern Dental Association.

At a meeting of the dentists of Nashville, called to take action with reference to the death of Dr. Franklin, resolutions were reported and unanimously adopted expressive of their high estimate of him as a man and a dentist, and of condolence with his parents.

J. H. PREWITT, D.D.S.

Died, at Madisonville, Ky., December 31, 1887, of heart disease, Dr. J. H. Prewitt, in the forty-second year of his age.

Dr. Prewitt was first vice-president of the Southern Dental Association and clinical instructor in the Dental Department of Vanderbilt University at the time of his death. One who had known him long and well writes: "Pure, noble, generous, an humble Christian, and an ardent lover of his profession,—this tells the story of his life."

At a meeting of the dental class of 1887–88 of Vanderbilt University, resolutions of respect and condolence were adopted, with expressions of the esteem and affection of the class.

PERISCOPE.

On the Clinical Value of the Teeth.—The examination of the permanent teeth yields many points of interest in connection with diseased conditions. I have given much attention to this subject and desire to invite the Fellows to the conclusions I have reached.

When the teeth are examined in position—the subject being known to have no hereditary impression on the nutritive forces—the tubercle on the posterior surface of the upper central incisor is small, but slightly developed, and is gradually lost upon the posterior surface of the crown; the canine tooth presents a rounded, uniformly robust posterior surface, and the upper molars yield four cusps (excepting the third molars, which are variable).

The incisors of the lower jaw exhibit small, rounded tubercles; the stomach tooth is rounded and robust posteriorly; and the bicuspids are furnished with inner cusps which are well defined, and are either joined to the base of the outer main cusps or are separated by a shallow interval. The first molar is commonly composed of five cusps, of which the outer row yields three and the inner row two; the second molar is composed either of five cusps, of which two are in the outer row, two on the inner, while the fifth is on the posterior border, or the tooth is composed of four cusps only.

In conditions of the system which are usually termed strumous, in persons of tubercular ancestry—in persons having the ordinary signs of congenital syphilis as this condition is determined by keratitis, fissured oral angles, and notched upper central incisors—the teeth do not conform to the above description.

Since individual variation of teeth within the limits of health is very great, it is impracticable to state with the exactness of a formula the nature of deviations. In a general way the following account will be found of value in identification.

The tubercle of the upper central incisor is large, reaching often half way up the posterior surface of the tooth, where it ends abruptly. In some subjects of congenital syphilis its limit can be discerned from in front by a sulcus extending across the face of the crown. In the serrated tooth of measles the anterior deformation corresponds to that portion of the crown which lies below the incisive tubercle. The posterior surface of the canine tooth is rounded and almost columnar. The molars are small—the second and third ordinarily composed of three cusps only, and the wisdom-tooth often fails to erupt. The opposed surfaces of the cusps, as a rule, exhibit the same disposition to be rounded which has been noted on the posterior surface of the canine teeth and on the incisive tubercle. At times the second molar is small and placed obliquely in the arch.

In the lower jaw the tubercles of the incisors (both centrals and laterals) are exaggerated, but to a less marked degree than is the case in the upper incisors. The bicuspids either present small inner (lingual) cusps, or the cusps in a true sense are absent, and primitive volute rings of enamel of low elevation surround the base of the main cusps. The first bicuspid tooth closely resembles the stomach tooth, while the second recalls the shape of a small grinder, owing to the disposition existing for a posterior prolongation of the volute

ring, and to an oblique thickening of the ring in the middle, where the inner cusp should be normally found. The first and second molars are usually without the fifth cusp, and the opposed surfaces are convex and less closely related than is the case in the normal teeth. The third molars are often concave, without determinate cusps; may be monstrously exaggerated in all their parts, or be absent. The crowns of all the molars are often of slight elevation,—presenting the conformation known as brachyodont.

In summarizing these results, it will be noted that all the changes are in the direction of irregular evolution. The teeth are either retarded or precociously advanced. The repressed forms are seen in the abortion of the lingual cusp to the first lower bicuspid, in the small obliquely-placed second upper molar, in the abortion of the fourth cusp of the upper molars, in the absence of the fifth cusps to the first and second lower molars, and in the abortion of the third molars; in the precocity in the exaggeration of the incisive tubercles, in the markedly convex posterior surfaces of the canine teeth and of the opposed cusp surfaces of the molars, in the extension backward of the lingual surface of the lower second bicuspid, and in the occasional monstrous form of the third molars.

In all nutritive processes atrophy and hypertrophy are closely allied, for both express aberration of the normal growth-force of the ecomomy. A morbid expression of over-production may exist side by side with an under-production and both be expressive of the action of a wavering, languishing, or undue stimulation of the parts. Many proofs from biology in support of this general statement could be advanced.

As indubitable evidence of impairment of the general formative processes, such teeth may serve as guides to the general state of the system, and the study of the teeth be accepted as an aid in diagnosticating impaired conditions of health.

The characters of teeth, as described, are common, since struma, tubercular predisposition, and congenital syphilis are common. For convenience, the incisor, with the exaggerated tubercle, may receive the name of the *gibbous incisor*, and the primitive form of the lower bicuspid may receive the name of the *volute bicuspid*. I have called the concave wisdom-tooth the *crater-like tooth* in my notes. It appears to be a sufficiently exact term to express the form.—*Harrison Allen, M.D., from Transactions of the College of Physicians of Philadelphia.*

HINTS AND QUERIES.

TO THE EDITOR OF THE DENTAL COSMOS:

IN the December (1887) issue of the DENTAL COSMOS there appeared a description of the new Richmond crown. It would seem that this crown was invented to overcome the difficulty of properly shaping the end of the root for the reception of ordinary crowns.

This leads me to the conclusion that perhaps the method I am using for finishing root-ends has not been thought of by others: I first grind the root to the gum-margin with a stump corundum wheel; then I take a small, flat-sided corun-

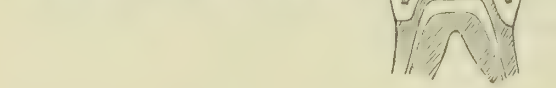
dum wheel, of the same circumference, as nearly as possible, as the root operated upon, and mount it upon an engine mandrel that passes through the wheel (see illustration), the free end of the mandrel to enter the root-canal. This retains the wheel in position, and prevents its leaving the root. Its revolutions leave the end of the root in beautiful shape. Inclining the hand-piece either outward or inward

bevels the root either way. If I do not have a wheel small enough, I take the nearest size corundum point, mount it, and then reduce it by revolving it against a piece of hot iron. A shouldered mandrel might be made for this purpose, and wheels of the proper diameter, about one-eighth of an inch thick. Three or four sizes would be needed.

The method of working on bicuspids is to have the diameter of the wheel equal the mesio-distal diameter of the root, and insert the free end of the mandrel alternately in the buccal canal and the lingual canal until the surface is satisfactory. It does not work quite as well in these as in circular roots, and the chisel or sharp excavator is sometimes necessary for the finish. Still, it is the best method I have ever tried. The little wheel will pass right up under the gum, and will not wound it much.—A. Morsman.

Anchor-Pins for Fillings.—Dr. L. West, of Marionville, Mo., suggests the use of double-headed platinum pins as anchoring bolts for approximal fillings; that furthermore form more or less of the grinding surfaces of some molars and bicuspids, and are therefore liable to be dislodged by hard usage in mastication. The illustrations exemplify cases of that kind which have been made secure by building anchor-pins into the fillings, as suggested by Dr. West. The crown view and section of a bicuspid, Fig. 1, make clear the character of the operation; the anchor-pin being also shown separately, and magnified for more perfect representation. Fig. 2 is a similar illustration of the use of the anchor-pin in a filling which extends from side to side over the crown.

Fig. 1. Fig. 2. Fig. 3. Fig. 4.



It is, however, a somewhat difficult matter to properly place the anchor-pin, because pressure on one head in packing the material around it is likely to lift the other head from its bed, and this is especially liable to occur when the filling-material is amalgam. Instead of the headed pin, therefore, it is suggested that a section of platinum anchor-screw wire may be more readily built in and more securely bolt the matrices together. This is made evident by Fig. 3, the detached screw-bolt being shown magnified for its better definition. A curved section of screw-wire may likewise be employed, as seen in Fig. 4. It is obvious that the screw-wire, unlike the smooth pin, will resist a parting strain at every point of its length, and special forms may be given the wire sections to meet any peculiar case.

The examples given will serve to place the several suggestions fairly before the profession as means for meeting emergencies in the class of dental operations for which they will probably be found occasionally useful.—S. H. W.

Dental Anomaly.—In May, 1883, Mr. O. T. R. came complaining of pain in the superior left second molar. The palatal root was so denuded that an instrument could readily be passed over the apex. As the tooth had an antagonist

and was well supported in dense structure by the buccal roots, it was decided to destroy the pulp, amputate the palatal root, and fill the buccal root-canals. That was done and the operation completed on the 15th of August, 1883.

In November of 1884, after a severe attack of rheumatism, an alveolar abscess was formed, and proving not amenable to treatment, the tooth was removed. Some time in the following December the patient came again, with a cheek so swollen that it was with great difficulty that the third molar was extracted; whereupon what had been obscure to the degree of mystery was made plain by the discovery that the distal buccal root of the second molar had been vitally united to the mesial buccal root of the third molar.

The devitalization of the pulp of the second molar had therefore resulted in the death of the pulp of the third molar, which, being free from caries, afforded no visible sign of the cause of the disturbance, which was yet evidently due to some lesion of that tooth. The cut shows the twin molars as photographed upon the wood on which the engraving was done, and the absence of the buccal root from the second molar is accounted for by the amputation previously mentioned.—A. E. MATTESON, Chicago, Ill.

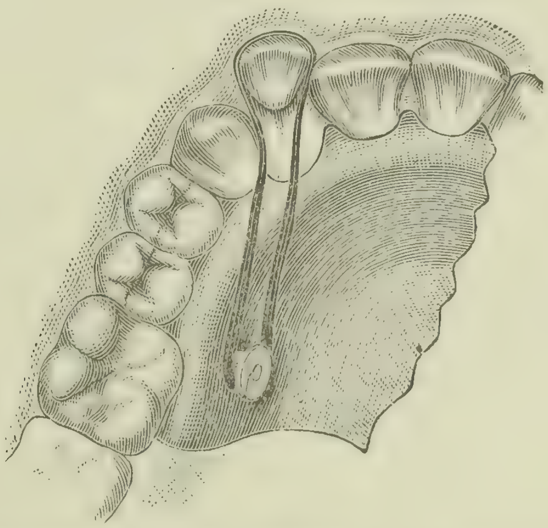
REGULATING STUDS.—Vulcanite and other fixtures for regulating teeth often require the attachment or insertion of studs or hooks, from which rubber rings may be stretched onto the teeth that are to be put into place. I have made such studs of celluloid or hard rubber in form like that shown in Fig. 1, drilled and tapped through its center as shown in the section, Fig. 2. This stud I readily fix on the plate or bar by means of the screw, and a section through the stud,

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.



screw, and plate (see Fig. 3) makes evident the security of the attachment. In Fig. 4 is seen a plate in place, and a rubber ring stretched from the stud to the lateral, which is being pulled into position. The size of the stud-shank is such that the ligature will not be cut by the strain, and the stud-head is round and smooth, and overlaps the ligature, so that the tongue will neither be chafed nor interfered with to any appreciable degree during the progress of the regulating operation.—S. J. SHAW, Boston, Mass.

TO THE EDITOR OF THE DENTAL COSMOS:

DEAR SIR: I have a model, taken from the mouth of a little girl not quite three years old, showing five superior incisors. Between the right superior central

and cuspid are two laterals, evidently both growing from original germs or in-dippings of the epiblast during fetal life.

Will some of your readers, who have made the physiology and histology of these parts a study, tell me if I may expect each to be succeeded by a permanent tooth? It is generally supposed that supernumerary, like the permanent, teeth are originated by buds from the deciduous or from the enamel-organ of the permanent, in the same manner as the permanent from the deciduous; but where they are of the deciduous, formed and erupted about the same time, and well placed in the arch, why is it not reasonable to expect the supernumerary to have its successor as well as any other tooth in the arch? Will the law that fixes type forbid it?—J. W. F.

Temporary Filling.—In the "Hints and Queries" department of the Dental Cosmos for December, H. S. W. makes a plea for a temporary filling. The following will be found to subserve a good purpose: Take a half ounce (or more if you desire it) of pure white wax; melt it in a small porcelain dish, and while hot add scraps of gutta-percha until quite thick. Stir continuously till the latter is dissolved and both thoroughly incorporated. Set off, stir occasionally, and when cool enough make into rolls the size of a lead-pencil; then you have a temporary filling at once convenient, easily manipulated, and sufficiently durable for any purpose "of a designedly ephemeral character," and something more than that. I have used yellow wax and gutta-percha with gratifying results.—L. E. Disney, Peabody, Kansas.

To the Editor of the Dental Cosmos:

Dear Sir: I inclose an advertisement which has appeared daily in the *Times* of London for several months. It would be interesting to learn what representations have been made to these young men to induce them to allow their names to be advertised in this manner, and it is a great pity that they have not been better advised, for they put themselves quite outside the pale of professional respectability and recognition by such publicity:

"American Dental Institute (limited), 55 St. James street, S. W. (near Piccadilly), 34 Thurloe-square, South Kensington, and 44 Finsbury-square, E. C.—Established for the practice of genuine American dentistry, at uniform and moderate fees. Specialties—the adjustment of artificial teeth without any plates or wires whatsoever. *All teeth, however badly decayed, permanently saved.* Loose teeth tightened, and painless treatment. The privacy of the most refined dental practice is observed throughout the institute. The dentists in attendance are graduates by examination of recognized American colleges. (Here follow nine names, which we omit, as the object of this communication is not personal.)

...., New York College.
...., Penn. University.
...., Boston College.
...., Harvard University.
...., Iowa College.
...., Harvard University.
...., Boston College.
...., Penn. University.
...., Baltimore College.

"No appointment or fee necessary for consultation. Hours 9 till 6. Pamphlet free on application to the secretary, at each address."

It may be that the pecuniary results compensate them for professional ostracism, but one would not think so.—An American.

THE

DENTAL COSMOS.

VOL. XXX. PHILADELPHIA, APRIL, 1888. No. 4.

ORIGINAL COMMUNICATIONS.

GANGRENOUS TOOTH-PULPS AS CENTERS OF INFECTION.

BY W. D. MILLER, PH.D., D.D.S., BERLIN, PRUSSIA.

(Read by Dr. C. M. Wright, before the Mississippi Valley Dental Association, at Cincinnati, Ohio, March 8, 1888.)

THE subject which I have in mind, not to discuss, but simply to propose to you for consideration or investigation, is one of very great interest to the dentist, as well as to the general practitioner and bacteriologist.

You are all familiar with the commonly accepted belief that pericementitis and alveolar abscess are in the majority of cases caused by putrefying organic matter in the roots of teeth. It is especially well known that the same cause may give rise to much more serious results,—among others to osteitis, necrosis, pyemia, septicemia, etc., terminating not infrequently fatally.

It becomes therefore a matter of the greatest importance to obtain an insight into the character of the infection brought about by the agency of putrid, gangrenous, or suppurating tooth-pulps, and of the micro-organisms associated with it.

It is a fact well known that pathogenic bacteria are frequently found in the human mouth (we might say, I think, constantly, particularly in unclean mouths), and a suppurating tooth-pulp seems to act as a sort of sieve to separate them from the non-pathogenic, as I have not been able to find the great variety of bacteria in tooth-pulps which I have found in the mouth. Moreover, the bacteria of such pulps, as far as my observation at present goes, appear to be as a rule more pathogenic than the bacteria of the healthy mouth.

The experiments which I have undertaken in connection with this subject are little more than begun, and Dr. Wright is responsible for their being presented in their present unripe condition. I shall consequently only attempt to describe the methods of experi-

mentation which I have adopted, and to give at most one or two of the results thus far obtained.

In order to secure portions of gangrenous pulps which might not be impurified by outside material, I proceeded as follows: The freshly-extracted tooth was mechanically cleaned and immersed for a moment in a solution of bichloride of mercury (5 to 1000). It was then rinsed in a large quantity of sterilized water, in order to remove the sublimate; split with sterilized forceps, and a portion of the putrid pulp removed,—of course, with a sterilized needle.

The material obtained in this way was used for inoculating mice subcutaneously, a pocket having been formed at the root of the tail for this purpose. Up to the present time I have made 118 inoculations, followed, in a great majority of the cases, in 24 hours by inflammation and swelling at the point of inoculation. At the end of the second or third day a small abscess will usually be found, which, if opened, evacuates a drop of pus densely impregnated with micro-organisms. The reaction is not severe, as it generally is when a human being is inoculated, by forcing grangrenous pulp-tissue through the apical foramen, for the reason that in the latter case the point of inoculation lies much deeper, and is surrounded by bone-tissue.

In the case of the twelfth pulp experimented with the reaction was very interesting and characteristic. In 12 to 15 hours a blackish or bluish-black spot had formed around the pocket; in 24 hours some swelling was noted, and also a slight fluctuation,—*i.e.*, a slight formation of pus. At the end of the second day a tumor about the size of a pea had developed, which on being punctured evacuated a considerable quantity of pus mixed with gas, and emitting an exceedingly strong and offensive odor. A second mouse inoculated with a small quantity of this pus developed exactly the same symptoms; likewise a third inoculated from the second, and so on to the twelfth generation. At this time I was obliged to leave Berlin for a few days, during which the mouse last inoculated died, and with it this series of inoculations. The specific bacterium of this strictly gangrenous process I was unable to cultivate, for the reason that it, like many others of the oral bacteria, does not grow upon artificial media.

In two other cases the inoculation was followed by blood-poisoning, the mice dying in from two to six days with large numbers of micro-organisms in the blood and organs. From these few experiments it may already be seen that each gangrenous tooth-pulp may be in itself a center of infection, or it may serve as a channel through which pathogenic bacteria from the oral cavity may invade the tissue surrounding the point of the root, or even obtain entrance into the circulation. I propose in the course of a few months to report at length upon the experiment now in progress.

TEETH REGULATORS.

BY DR. S. J. SHAW, BOSTON, MASS.

For drawing outward an erratic incisor, a cross-bar, a screw with nut, and a loop or band form an effective combination. In application, however, the bar is apt to turn from the horizontal line, and to prevent this I solder to a face-plate the screw and a parallel guide-pin (Fig. 1), which with the screw passes through the bar and keeps it at right angles to the face-plate. This plate I attach to the tooth with waxed floss silk, and the fixture is thus made to serve for every such case that may be presented. For a retaining fixture, I simply solder a bar to a face-plate and tie it on with floss silk.

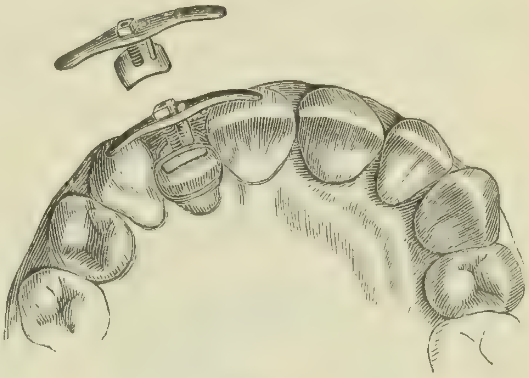


Fig. 1.

The regulation of complicated cases I accomplish by a system of pivoted levers operated by jack-screws. In Fig. 2 it will be seen that the lower bicuspids must be moved outward before the cuspids can be brought in. For that purpose I made a vulcanite plate fitting over the bicuspids and molars. With a narrow, fine saw I cut sections from the plate of forms such as I could pivot at points behind the molars, and insert two jack-screws opposite the first bicuspids. The illustration shows the completed contrivance in position.

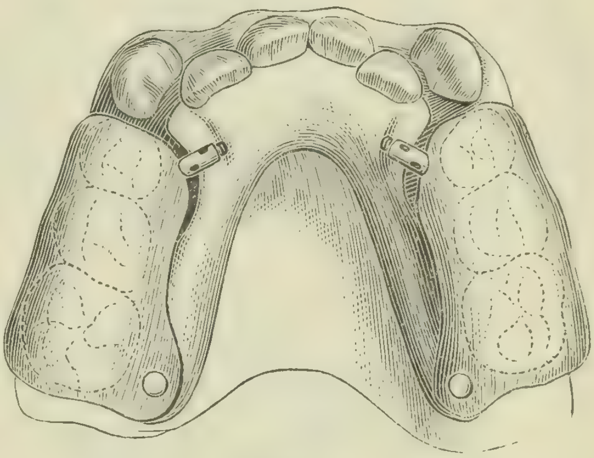


Fig. 2.

In another instance, in which for improved occlusion it was desirable to push outward the left superior bicuspids, the pivot was placed opposite the cuspid, and a metal screw-arm built into the plate opposite the molar (Fig. 3). It is apparent that successive turnings of the screw would swing the lever outward and carry the bicuspids into place.

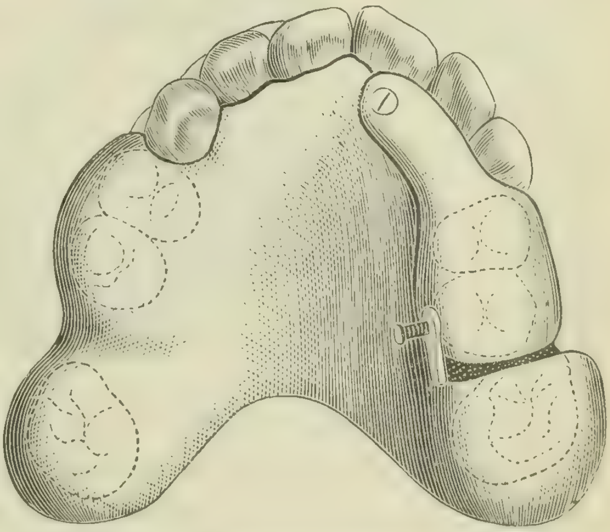


Fig. 3.

An occasional case is presented wherein it is necessary to pull one tooth inward, and push an adjoining tooth outward. The inferior right second bicuspid and first molar represented in Fig. 4 are examples. For this case the lever section was pivoted opposite the second molar, and embraced the first molar, from the plate in front of which a metal screw-arm extended so that the screw would impinge upon the face of the bicuspid. The turning of the screw pushed the bicuspid inward and the molar outward, by a peculiarly complex action of the members of the apparatus,—which, however, made the two teeth serve as abutments each for the other, while being pushed in opposite directions into place.

Fig. 4.

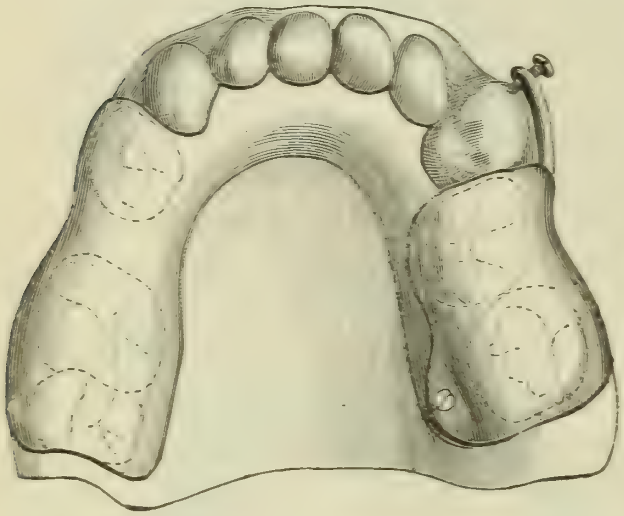


Fig. 5.

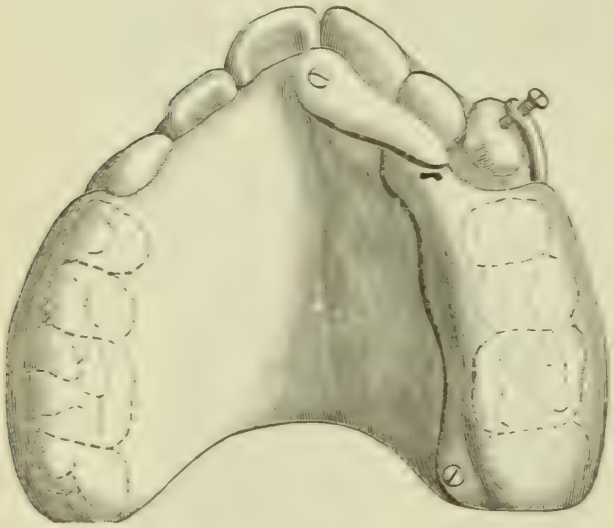


Fig. 5 exhibits a case in which the superior left central incisor requires partial rotation, the lateral and both bicuspids an outward displacement, and the cuspid to be pushed inward. All these movements can be simultaneously effected by the compound pivoted levers and screw-arm shown. The illustration makes clear the details of the construction and operation of the device, which so directs and adjusts the mechanical powers brought into action that the turning of the screw against the neck of the cuspid will result in pushing it, and bringing the four other teeth into symmetrical alignment at one and the same time.

It will be understood that in all the cases here illustrated casts showing the restorations of the teeth to their normal relations and positions have been at hand, but the cost of the cuts would have been a great addition to the already expensive illustrations, and, therefore, as not really necessary to a complete comprehension of the operations, those casts have not been herein represented.

I have other exemplifications of both the simple and compound lever appliances in models on casts of the cases in which they were

employed, but the specimens given are deemed sufficient for the purpose of bringing the devices fairly before the profession.

It is probably well to add that the wax model for the vulcanite plate should be judiciously thickened where the pivot and the jack-screw are to be placed, and the case so carefully studied that the swing of the lever shall carry the tooth or teeth into the precise positions they are to finally occupy.

ADDITIONAL SEPARATORS.

BY S. G. PERRY, D.D.S., NEW YORK, N. Y.

In designing the separators which bear my name early efforts were made to render them adjustable to the different teeth. It seemed desirable to do this in order to secure ease of manufacture and consequent economy for those who might desire to use them. It soon became apparent, however, that to make them adjustable to a large class of teeth must render them poorly suited to a particular class, and I determined to abandon the attempt to make them adjustable, and to adopt the plan of fitting one for the molars, one for the bicuspids, and one for the incisors. A further trial developed the need of one for the molars and bicuspids, and the set of four was made in the hope that that number would be found sufficient. I have since found many cases where the bicuspids and cuspids could not be separated by any one of the set of four, and I have designed a fifth one especially for these teeth. This separator is shown in Fig. 1. The inside bar is made very short to suit the quick curve of the arch at this point, and the jaws are so shaped that they will slip over nearly all teeth of this class, and yet fit snugly when in position. If a case is met where the cuspids are too large for this separator, the one designed for the bicuspids will be found to answer. I have found this "E" separator—the alphabetical classification adopted by the manufacturer will be found convenient—to be of great value for use on the centrals and laterals as well. In some instances it is more satisfactory than the one designed for these teeth. It is also particularly well suited for use on the lower bicuspids. In fact, I think it would be difficult to improve it for use on these teeth. I have also used it many times with great satisfaction on small upper bicuspids. It can be applied to so many of the front teeth that it may be considered by far the most universal of the set. It is evident that many operators besides myself have felt the need

Fig. 1.

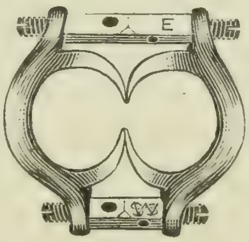
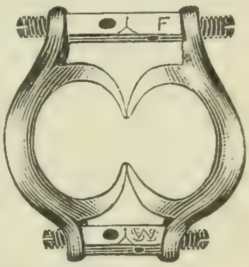


Fig. 2.



of this additional separator, for I have received many letters from different parts of the country asking if such a separator could not be made. I have also received many requests for a "D" separator reduced in size. I have therefore designed the one shown in Fig. 2. I have found some cases of small incisors where it has operated admirably. This will be called the "F" separator. With this set of six I think it will be found that nearly all the teeth can be separated. If one will not do, another will.

It may be well to add a word in reference to the general use of these separators. Some of my earliest forms were so designed that the jaws could not reach the gums, even when used on the shortest teeth. They were easily applied, and of course could be operated with no thought of the gum. But it often happened that, in using them on teeth having large approximal cavities, the jaws would rest on the teeth over the large diameter of the cavities, and of course at the risk of crushing in the frail walls. In such cases they were useless. I therefore decided that it would be best to design them so that the jaws would engage the teeth near the gum, and below the boundary of large cavities. Of course this involved the danger, in the hands of careless operators, of disturbance of the gum when used on short teeth. In seeking for means to overcome this danger, I found, after trying many different methods, that the best result could be easily reached by the use of warmed masses of red gutta-percha placed under the bows on the ends of the teeth. This method was published in the article in which these separators were described. The gutta-percha is easily applied, and if the screws are turned gently while it is still warm the bows imbed themselves in it in such a manner as to hold the separators with great firmness, and with absolute safety to the gum. I call attention to this here, fearing that some operators may have overlooked this simple means of protecting the gum.

Among the earlier forms I also designed a separator that was intended to rest on the ends of the teeth that were to be separated. In many instances this worked well, but it often happened that it did not allow sufficient latitude in its application or sufficient working room about the teeth. I therefore adopted the size and form given the separators as now manufactured, and longer use has not led me to desire to change them.

Dr. Charles Allan has designed a right and left curved wrench which is easily applied to the bars in any position in the mouth. I have used it for the back teeth with a great deal of satisfaction. For the front teeth I think I still prefer the straight wrench which goes with the set.

DENTAL ANOMALIES.

BY JOHN A. DALY, D.D.S.,

Demonstrator in the Dental Department of the National University, Washington, D. C.

On January 4, 1888, Dr. H. H. Barker requested me to examine the mouth of Mah-Phoon, the old woman of the Hairy Burmese Family, aged about seventy years, who was on exhibition in the city. She had been under Dr. Barker's treatment for senile debility, and as her mouth seemed to trouble her he had concluded that the extraction of some of the teeth would be necessary to a successful treatment.

I found a very deaf, blind, untidy, emaciated, and feeble old woman sitting on a mat on the floor. With some difficulty I introduced the index finger of my right hand into the small and contracted mouth. Offensive pus seemed to exude from around every tooth, and several teeth appeared to be lying loosely in their sockets.

We determined to remove as many teeth as possible at one sitting. A thirty per cent. solution of the muriate of cocaïne was applied to the gums, and after waiting a few moments I proceeded to extract. I removed thirteen teeth,—viz., four upper and four lower incisors; one superior cuspid; one lower first bicuspid; one upper second bicuspid; one left upper molar, and one right lower molar. The two molars represent the two double teeth as described by Dr. Caldwell and seen in the cuts herewith presented. In reality fifteen teeth were removed. The patient stood the operation very well, considering the fact that some of the teeth were extracted with difficulty.

January 9. The condition of the patient's mouth is greatly improved. The left side of the alveolar process of the inferior maxilla is extensively hypertrophied, and denuded of its periosteum. The propriety of chiseling off a portion of the necrosed bone was considered by Dr. Barker and myself, but it was deemed advisable to wait until her debilitated condition improved before subjecting her to the risks of further operative procedures.

The teeth were submitted to Dr. C. T. Caldwell, the lecturer on histology in the university, who has kindly furnished the following accurate description and drawings of them:

WASHINGTON, D. C., January 6, 1888.

JOHN A. DALY, D.D.S.

DEAR DOCTOR: Upon examination of the teeth referred to me for that purpose, I find that we have, in the specimens represented in the drawings marked Nos. 1 and 2, two very remarkable instances of gemination or organic union of two neighboring teeth. The measurements and outlines of the drawings are as near as possible correct.

The lines A B and C D are intended to show the position of the teeth in the

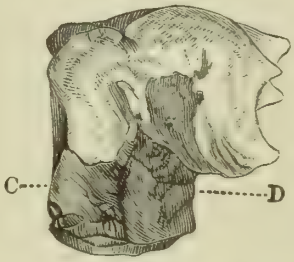
jaw, the portions above A B and below C D indicating the parts exposed above the gum. They were covered by a thick layer of dark-brown concretion, the exact nature of which I have not yet determined.

No. 1 shows the right second molar and wisdom-tooth of the lower jaw so completely joined together that both crowns and roots are united throughout their entire length. The two roots of the second molar may be easily made out in the specimen, and just behind them, and completely fused with them, is the connate root of the wisdom-tooth.

Still more remarkable than this is the specimen represented by No. 2, wherein the union of two upper molars is confined to the roots, which are so welded or blended together as to leave but little trace of the several fangs. This specimen was at first supposed to be a large-sized molar with an enormous exostosis, but a

Fig. 1.

Fig. 2.



section through the parts shown in the drawing disclosed a pulp-cavity, and close examination revealed the fact that this portion of the mass is in reality the crown of a tooth, made up of enamel, dentine, and pulp-cavity, filled with nerve and nutrient vessels, as in ordinary teeth. The tubercles or cusps having never been subjected to wear, are in a perfect condition on what should have been the top or free surface of the crown, while the roots had become coalescent with those of its neighbor in such a manner that only one of the united teeth could assume an upright or natural position in the jaw, the other being forced into a horizontal position, with only a side protruding above the surface of the bone.

This gemination or coalescence of contiguous teeth occurs during an early stage of their development, and is due to absorption of the intervening bony tissue caused by pressure, where as in this case several very large teeth crowd themselves into a very small mouth. Very respectfully,

C. T. Caldwell, M.D.

Great interest is attached to this case, from the inconsistency of the published history of the Hairy Family and the clinical history and anatomical peculiarities of the patient's teeth.

In the history of King Theebaw's Hairy Family, published by P. T. Barnum, we find this statement: "Of the seven children born of this marriage, four were hairless and perfect as any Burman, and the remaining three were hairy. Of the three hairy, two were males and one female, and the only surviving one is the lady by the name of Mah-Phoon, now on exhibition, and the daughter of Shoe-Moung. All the three hairy ones had the same dental peculiarities as their parents,—that is to say, total absence of grinders or molars, having nothing but four incisors in front of the upper jaw and six in the lower, the back part of the gum representing a hard ridge."

Mah-Phoon has had four hairless and three hairy children. "The three hairy ones had the same dental peculiarity as before,—that is to say, total absence of grinders or molar teeth."

In a note on page 5 we find: "On the arrival of the family in Bombay, Moung-Posset (Mah-Phoon's son) underwent an examination by Messrs. Walton and Bromley, the renowned American dental surgeons, who at once discovered a similar deficiency. They also stated as a result of their examination that in the upper jaw Moung-Posset had four teeth,—two incisors and two cuspids, the two lateral incisors being wanting, while the lower jaw contained two cuspids and four incisors."

Subsequent events have disproved the statement of the above quotation so far as the old woman's teeth are concerned, and the manager was unwilling to have the mouth of Moung-Posset examined, so that I am unable to verify the statement of the distinguished American dental surgeons with regard to his dental peculiarities.

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting Tuesday evening, January 10, 1888, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street.

The president, Dr. J. Morgan Howe, in the chair.

The President. Gentlemen: I take great pleasure in introducing to you Dr. R. R. Andrews, of Cambridge, Mass., whom we all honor for his patient and thorough investigations in the field of histology. Dr. Andrews will read a paper entitled

The Development of the Teeth, with Demonstrations of the Formation of Dentine from the Odontoblasts and Fibril-cells.

Dr. Andrews. Mr. President and Gentlemen: It was my intention to have prepared for you at this meeting a paper on Calcoglobulin and the part it plays in calcification. I had commenced the work, but ill health and an unusual press of work during the last month have prevented me from carrying out the plan, and I am therefore obliged to read to you to-night in part from a paper that has already seen service. To this I have added, in continuation of the subject, much that I had prepared for the proposed essay; and I trust this will lend an additional interest to those of you who may have heard me. The subject which we are to consider is the formation

of dentine from two varieties of cells,—odontoblasts and fibril-cells. The processes of the development of a tooth up to the formation of the dental follicle are known, and need not be considered. After calcification commences, and after the action of reagents on these tissues to prepare them for microscopical examination, there comes in a diversity of opinion among the workers in this special field of histology. The methods of preparing the tissues which are commonly used are far too harsh for the delicate structure of a developing tooth, and there is very little satisfaction in working from tissue that has been prepared under the ordinary methods.

The preparation of the tissue from which my photographs are made differs very considerably from the foregoing. I take the forming teeth from the jaws of embryos, at or nearly at the time of birth, while the tissue is still warm. These are placed in a quarter of one per cent. to one-half of one per cent. solution of chromic acid, which is changed daily for three or four days. At the end of this time the edges of the dentine that were calcified are found to be sufficiently softened to make a number of sections. The teeth are taken from the acid solution, washed in distilled water, and then placed in a solution of gum-arabic for several hours. They are then put in a solution of alcohol to take out the water. Paraffin and lard are melted together and poured into a convenient mold. When the former is clouded in the process of cooling, the tissue, which has had its outer surface dried as much as possible with bibulous paper, is placed in it and allowed to cool. I cut until the calcified tissue is reached. The method has cost me a number of fine knives, for each cutting ruins an edge. But I have the satisfaction of working as near life as we can with our present knowledge. After cutting the sections they are placed in distilled water for a few minutes to dissolve out the gum, and are then mounted in Markoe's glycerin jelly. The difference in the appearance of the tissue prepared by this method is marked.

After much thought and investigation, I am forced to believe that there are two varieties of cells called into action in the formation of the dentine,—the odontoblast, which is little more than a mass of membraneless protoplasm, and a cell having a higher vital function, the fibril-cell or dentine-corpuscle. (See Fig. 1.) In the formation of the bones of the jaw I also believe there are two forms called into play, —the osteoblast or matrix-former, and a cell having a higher vital function, the bone-corpuscle, which remains as a nourishing center within the lacunæ; and also, in the formation of the cementum, there are the cementoblast, or cement matrix-former, and the cement corpuscle, which is a nourishing center within the calcified cement.

In the developing cementum the cementoblast can be seen forming the cementum, and there is an absence of other kinds of cells than the cementoblasts until we reach the deeper portions. These cementoblasts, by losing their identity in the process of calcification, form the thinner layers of cementum found just below the neck of the tooth, and, before becoming thoroughly identified with the already formed cementum, show a part of their former contour. Other cementoblasts are supplied by the adjacent embryonic elements, and the process is continued until the thicker portion of the

FIG. 1.

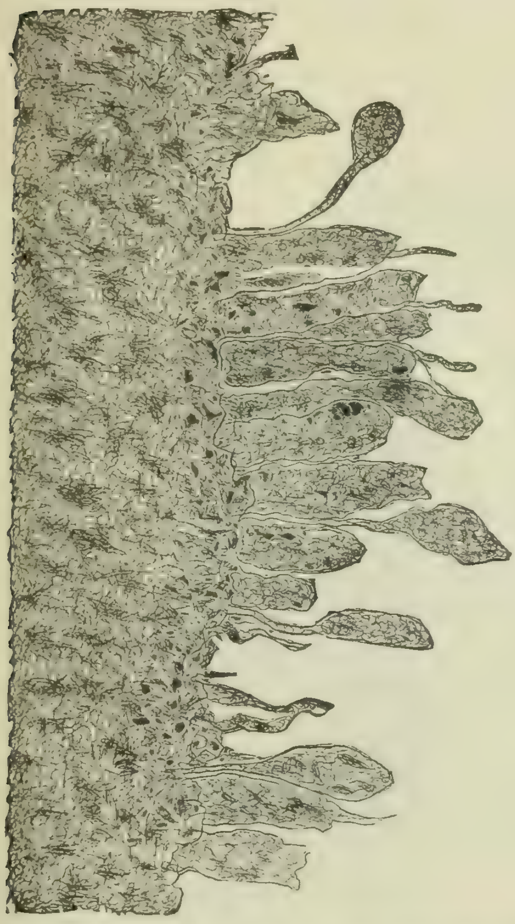


FIG. 1. (Specimen No. 19.) Odontoblasts and Fibril-cells. Objective, 1-12th immersion, Hartnack; about 1200 diameters.

FIG. 2.

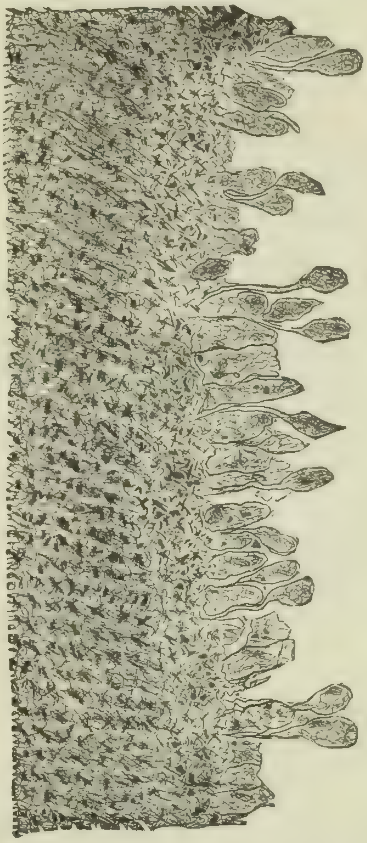


FIG. 2. (Specimen No. 21.) Showing the layer of Odontoblasts and Fibril-cells attached to the forming dentine. Objective, 1-7th immersion, Hartnack; about 600 diameters.

cementum is reached. Then we find a cell having a higher vital function. It is the cement-corpuscle, and we find it surrounded and inclosed by the matrix which has been formed by a direct calcification of the cementoblasts.

Tomes, speaking of the formation of the bones of the jaw, says ("Dental Anatomy," page 156): "As the osteoblasts calcify they lose their individuality, and all traces of the great majority of them disappear. Some of them, however, retain their individuality as encapsuled lacunæ." It will be seen that he makes no distinction between these two kinds of cells; but there is a marked distinction.

One has a higher vital function than the other,—that is, the nourishment of the basis-substance. While admitting that there are two forms of cells active in the formation of the jaw-bone, he does not admit the same in the formation of the dentine, yet says, "No one can speak of a young, active odontoblast as drawn out into the dental fibril. These cells are square and abrupt toward the dentine. They do not taper into the dental processes in the smallest degree."

FIG. 3.

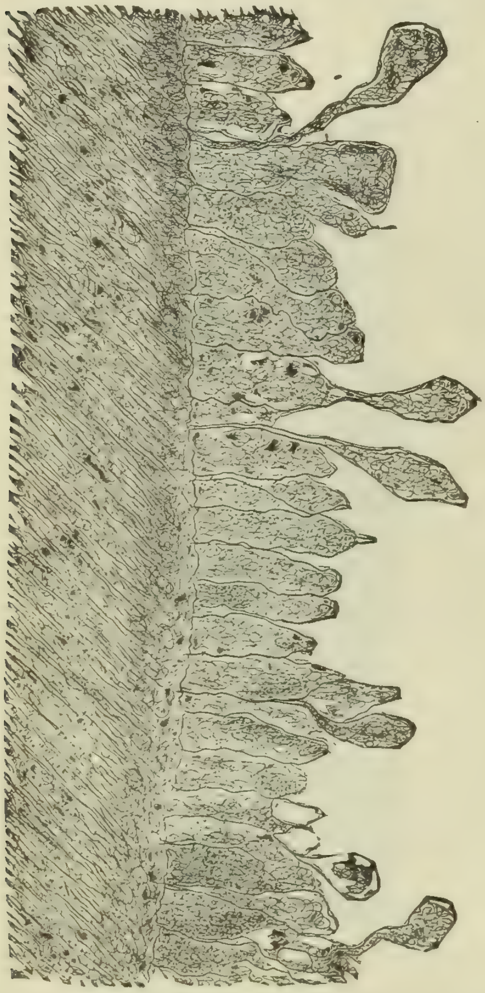


FIG. 4.

FIG. 3. (Specimen No. 24.) Showing the layer of Odontoblasts, square and abrupt against the forming Dentine, and some of the Fibril-cells, or Dentine Corpuscles, that are pear-shaped are seen running between them. Objective, 1-12th immersion, Hartnack; about 1200 diameters.

FIG. 4. (Specimen No. 27.) Showing the formed Dentine, the layer of Calcoglobulin, and two Odontoblasts, and a Fibril is seen *at the side* of one of them. Objective, 1-12th immersion, Hartnack; about 1000 diameters.

While these masses of protoplasm, the odontoblasts, are square and abrupt towards the dentine, it is a very easy matter to find among them, and just adjacent, large numbers of pear-shaped cells, drawn and tapering into the dental fibril. (See Figs. 1, 2, 3, 6, and 7.) These are the true fibril-cells. The odontoblasts, having no membrane, which are square and abrupt against the dentine, are hardly more than granular masses of protoplasm when calcification is active. At this time there is hardly a trace of a nucleus; the fibrils which appear to

come from them, described by Tomes as pulp, lateral, and dentine processes, originate really from the fibril-forming cell. They are forced into the edges of odontoblasts sometimes by pressure, and seem to be a part of them, but in fresh, thin sections I have seen these so-called processes move in the substance of the edge of the odontoblast by pressure on the cover-glass, tracing them to a fibril-cell beyond. These fibers cling to them after the process of granulation and calcification commences, and in the action of separating the cells these fibrils break, clinging to the odontoblast (see Fig. 4); hence the lateral, pulp, and dentine processes of Tomes. It is a difficult thing to demonstrate these processes in cross-sections of the odontoblasts, but I am very certain I have seen them with a fine

FIG. 5.

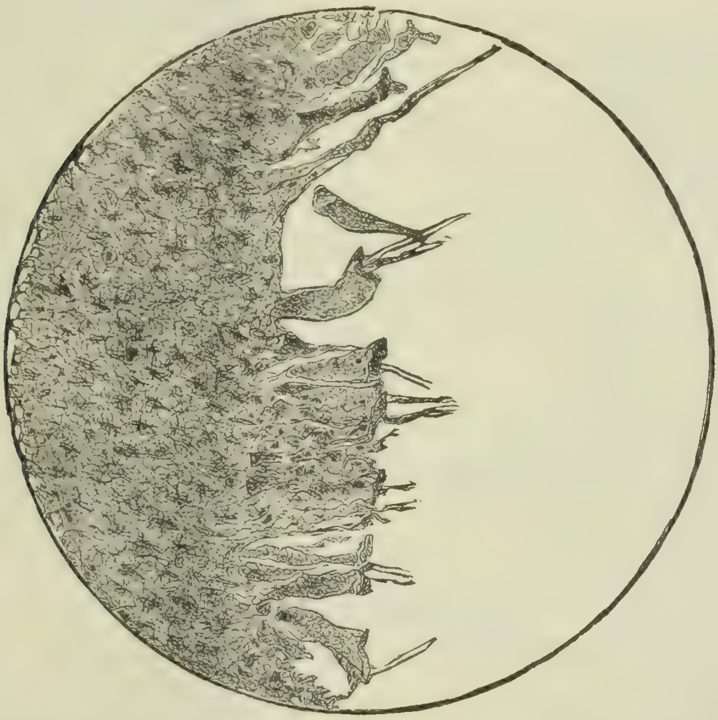


FIG. 5. (Specimen No. 34.) Odontoblasts that were square and abrupt against the forming Dentine. showing the line of demarkation between the Cell and the Fibril. They are attached to the pulp. Objective, 1-12th immersion, Hartnack; about 1000 diameters.

glass of high power. They appear as very delicate white spots in the substance between the odontoblasts, or just within the edge of them.

When the layer of odontoblasts is teazed away from the forming dentine, processes are seen pulled away from the tubes of the formed dentine, being apparently offshoots from the odontoblasts; but on careful examination there will always be found a line of demarkation between the process itself and the square end of the cell. (See Fig. 5.) This line seems to be a slight layer of calcoglobulin, and I have specimens which show these cells whose side masses of protoplasm have been pulled away, leaving a slight cross line of calco-

globulin that was up against the forming dentine, and also a ragged continuance of the process running into the pulp-tissue adjacent, with every appearance of having its origin there.

The fibril-cell, having a higher functional purpose than the odontoblast, is found to be almost always pear-shaped, having a process or processes next towards the dentine (see Fig. 6), and having sometimes a smaller process running into the tissue of the pulp. These cells are found in the layer with the odontoblast, as well as in the pulp-tissue adjacent,—the fibril being either long or short as the case may be. (See Fig. 7.) The fibril-cell is never found to be abrupt and square against the forming dentine, although sometimes it has an appear-

Fig. 6.

Fig. 6. (Specimen No. 35.) Showing Fibrils, Fibril-cells, and Odontoblasts; also the layer of Calcoglobulin and the forming Dentine. Objective, 1-12th immersion, Hartnack; about 1200 diameters.

Fig. 7.

Fig. 7. (Specimen No. 36.) Showing Fibrils, Fibril-cells, and Odontoblasts. The pulp has been teased away, leaving these cells clinging to the formed Dentine. Objective, 1-12th immersion, Hartnack; about 1200 diameters.

ance of that kind when there are two processes running into the dentine from a single cell, such as are found in newly-forming dentine. These afterwards join in one, and are branches of the parent fibril. They are frequently figured as odontoblasts by many writers. They are the origin of the dental fibril, having the same functions as do the bone corpuscles in the formation of bone,—namely, the nourishment of the basis-substance or matrix. Lent, who was a pupil of Kölliker, figured the fibril-cells with their long processes many years

ago. These are mistaken by Tomes as aged and spent odontoblasts.

When a tooth is fully formed, most of the writers picture the pear-shaped fibril-cells as odontoblasts. We find them on the periphery of the mature pulp, surrounded by embryonic elements, and it is from these elements, and not from the pear-shaped fibril-cells, that any addition to the walls of the pulp-cavity is formed. Called into activity, these elements become odontoblasts or osteoblasts, in the same manner as do the embryonic elements in the substance of the pericementum or periosteum become osteoblasts or cementoblasts when exostosis or hypertrophy of the parts occurs.

Between the dental fibril and the formed dentine surrounding it there exists a thin layer of partially-calcified tissue. This is always found between the organic and inorganic tissue in the development of bone, dentine, or cementum. It is the earliest stage in the process of calcification, and it is a part of the calcified tissue. It has been named, by Prof. Harting, "calcoglobulin." Of it Mr. Charles Tomes has written: "The insoluble salts of lime are altered in their behavior by association with organic compounds,—a fact which was first pointed out by Rainey, and has been more recently worked out by Prof. Harting and Dr. Ord. If a soluble salt of lime be slowly mixed with another soluble capable of precipitating the lime, the resultant lime-salt will go down as an amorphous powder, or under some circumstances in minute crystals; but in the presence of gelatin, albumen, and many other organic compounds, the form and physical character of the lime-salts are materially altered, and in the place of amorphous powder there are found various curious, but definite, forms quite unlike the character of crystals produced without the intervention of the organic substance. Mr. Rainey found that, if calcium-carbonate be slowly formed in a thick solution of mucilage or albumen, the resultant salt is in the form of globules, laminated in structure, so that the globules may be likened to tiny onions; these globules, when in contact, becoming agglomerated into a single laminated mass; it appearing as if the laminæ in immediate opposition blended with one another. Globular masses at one time of mulberry-like form lose the individuality of their constituent smaller globules, and become smoothed down into a single mass; and Mr. Rainey suggests, as an explanation of the laminated structure, that the smaller masses have accumulated in concentric layers, which have subsequently coalesced; and in the substitution of the globular for the amorphous or crystalline form in the salts of lime, when in contact with various organic substances. Mr. Rainey claimed to find the clue for the explanation of the development of shells, teeth, and bone. At this point Prof. Harting took up the investigation, and found that other salts of lime would behave in a simi-

lar manner, and that by modifying the condition of the experiment very various forms might be produced. But the most important addition to our knowledge made by Prof. Harting lay in the very peculiar constitution of the calcospherites, by which name he designated the globular forms seen and described by Mr. Rainey. That these are built up of concentric laminæ like an onion has already been mentioned; and Mr. Rainey was aware that albumen actually entered into the composition of the globule, since it retained its form, even after the application of acid. But Prof. Harting has shown that the albumen left behind after treatment of a calcospherite with acid is no longer ordinary albumen. It is profoundly modified, and has become exceedingly resistant to the action of acids, alkalies, and boiling water, and in fact resembles chitine, the substance of which the hard skin of insects consists, rather than any other body. For this modified albumen he proposes the name of 'calcoglobulin,' as it appears that the lime is held in some sort of chemical combination; for the last traces of lime are retained very obstinately when calcoglobulin is submitted to the action of acids. The calcospherite, then, has a true matrix of calcoglobulin, which is capable of retaining its form and structure after the removal of the great bulk of lime. Now, it is a very suggestive fact that in the investigation of calcification we constantly meet with structures remarkable for this indestructibility. For example, if we destroy the dentine by the action of very strong acids, or by variously construed processes of decalcification, putrefaction, etc., there remains behind a tangled mass of tubes, the dentinal sheaths of Newman, which are really the immediate walls of the dentinal tubes. Or, if bone be disintegrated by certain methods, there remain behind large tubes found to be the linings of the Haversian canals (Kölliker), and small rounded bodies recognizable as isolated lacunæ, and in the cuticula dentis we have another excellent example of this peculiarly indestructible tissue. In point of fact, as will be better seen after the development of the dental tissue has been more fully described, on the border-land of calcification, between the completed, fully-calcified tissue and the formative matrix, as yet unimpregnated with lime, there very constantly exists a stratum of tissue which in its physical and chemical properties very much resembles calcoglobulin."

I have devoted much of my leisure time during the last three months to the study of the calcospherites, and the tissue which is formed by the coalescing of them into the layer we call calcoglobulin. (See Figs. 4 and 6.) This study has strengthened me in my conclusions in regard to the formation of the bones of the jaw, the cementum, and of the dentine by the two varieties of cells. The first variety of these cells seems to have little or nothing to do with

the formation of the organic substance. Like the cells which form the enamel, nails, and hair, they are matrix-formers or builders, while the bone, cement, and dentine-corpuscles (the fibril-cells) which are imprisoned in the matrix by these builders have a higher vital function, and that is supplying the matrix with its nourishment. A recent writer informs us that the osteoblasts, in forming the jaw-bone, individually become calcospherules, and after becoming impregnated with salts of lime on their outer surfaces, thus forming the matrix, develop into the bone-corpuscles within; but wherever I have seen these calcospherites on the edges of the calcifying tissue they are losing their globular form, to become by coalescing a layer, taking into their substance osteoblasts, or odontoblasts, as the case may be. This is the layer Prof. Harting tells us of, calcoglobulin; and although it is demonstrated by the action of acids, it is evident that before this action on the tissue it was of a different nature than either the fully-calcified or the organic tissue from which it develops. Were it possible to study this layer during the life of the tissue, we might get at exact knowledge; for I am convinced it is in this that the secret is guarded,—locked in by death of the part. Yet we see enough to give an idea of what it might have been. In the cementum the matrix-formers are first inclosed, or partly inclosed, by rows of these globular masses, and a layer of calcoglobulin is formed. The cement-corpuscles inclosed within the matrix are larger than the osteo- or cementoblasts, as a rule, and vary much in shape and size. They are less numerous than in bone. If we study the process by which a pulp within a fully-formed tooth calcifies, we shall see that it is at the expense of the embryonic elements of that pulp. So, I believe, the dentine is formed at the expense of the elements of its formative pulp, and not at the expense of its edge-cells alone. I cannot tell just how much one cell may contribute to its line of calcified tissue from its outer surface to the pulp, but I have seen enough to convince me that it does not form the whole of it. We frequently see cell joining cell in the forming dentine among the odontoblasts.

My field of investigation has been almost entirely confined to this special subject, and however much I may differ from other workers, I have come to my conclusions after much thought and investigation. I have been compelled to change my former views, from what I have seen under the microscope, studying the tissues. I certainly do not speak any plainer than Klein, an authority of acknowledged ability in histology, who says: "However great the authorities who maintain that the cells of the outer stratum above referred to as the odontoblasts proper send processes into the dentinal canals, as the dentinal fibers, I must question the accuracy of this assertion,

for I cannot find convincing evidence of those odontoblasts doing more than producing the dentine matrix. As will be described below, the dentinal fibers appear to me derived solely from the deep layer of cells which, as has been mentioned just now, are wedged in between the former."

I shall now try and illustrate some of the points presented by my paper; first giving a short demonstration of the development of the teeth.

[Dr. Andrews's paper was illustrated with fully fifty photo-micrographic pictures thrown upon a screen, only a few of which, from lack of space, appear in the text. Dr. Andrews's illustrations are all photographs—not drawings.—Editor N. Y. O. S.]

The President. Gentlemen: We have heard Dr. Andrews's excellent paper, and our eyes have been delighted beyond measure with the series of beautiful photographs of the microscopic specimens which the doctor has caused to be thrown upon the screen. With such illustrations the subject should be well understood and ably discussed.

Discussion.

Dr. Geo. S. Allan. So interesting and instructive a paper as we have heard this evening, giving the results of months of hard work, should not be received in silence. The great trouble in discussing such a paper as this lies in the fact that it is a matter of demonstration—not a question of theory. It is a question of what we see under the microscope, and of how to interpret what our glasses show us. Certainly, taking these views as Dr. Andrews has pictured them on the screen, at first sight a demonstration seems to have been made that is almost perfect. We have the cells beautifully shown, those square-ended, plain cells, lying up in juxtaposition against the forming dentine, and also the fibril-cells. I have seen the pictures under the microscope, have studied Dr. Andrews's sections with the greatest pleasure, and now frankly state that I am still on the fence as to whether the interpretation which Dr. Andrews has given will hold good entirely. We must go back first, in trying to solve this problem, and ask ourselves, What is protoplasm? All these cells are protoplasm in the main. Of that there is no question. But Dr. Andrews says these cells differ in shape, and have different functions. Now, if we take a section of an embryo of the pig much younger, say three or four months, and examine it carefully under high power, immediately in contact with the layer of forming dentine will be found one single layer of cells, and not two layers. These cells apparently are all alike; they are approximately the same length and

the same diameter, and as far as we can see they lie in actual contact. In some like sections, where the tissue has been hardened more thoroughly than Dr. Andrews hardens it, we get cross-sections of these odontoblasts and fiber-cells together, and we see that they are hexagonal in shape, taking their shape simply from immediate pressure of one cell against another in their soft, semi-fluid condition. It would seem to me that, if there were two layers of cells, having different functions and different duties to perform in their development at this early stage of embryonic life, we could make them out more distinctly. We could see the fiber-cells lying immediately back of the odontoblasts, and they would differ either in shape or character, so that we could make them out; but so far I have not been able to detect any such differences at this early period of embryonic life. In sections prepared as Dr. Andrews prepares them, the protoplasm of the cells is not all hardened; the pictures as he throws them on the screen do not represent the tissues as far as possible in their natural state. Just as little preparation and as little technique have been employed as are admissible. Dr. Sudduth recently suggested that the peculiar shape of the so-called fibril-cells might be due, perhaps, to the fact that some of them have a stronger attachment to the layer of calcoglobulin and the forming dentine than others; some pull out readily, while in some cases the fiber will break off from the cell, or will pull out from the cell. In this way we may account for this condition which Dr. Andrews speaks of without necessitating a double series of cells with separate functions. How true that is I do not know.

It is a singular fact that almost all examiners who have taken up this question have first been on one side of the fence and then on the other. Dr. Tomes takes the view that the odontoblasts form not only the dentine proper—the matrix—but also the tubules. Kline insists upon it that there are two distinct systems of cells, as Dr. Andrews pictures them. Dr. Stowell, of Ann Arbor, first inclined to the same view that Dr. Andrews holds, and published pictures giving approximately the same representations. He afterwards retracted it, but gave no reasons for changing his views.

My principal objection to accepting this demonstration would be based on a study of the earlier conditions of the tissues than those represented by the beautiful pictures which Dr. Andrews has thrown on the screen. I candidly confess that to my mind it seems more natural that the odontoblasts should form both the fibril and the matrix, than it does that there should be a double system of cells, each having a different function. I make these slight criticisms only to show the doubt in my own mind. I think the more one studies the subject the more the doubt increases, because of the difficulty of

retaining in the mind the exact picture of what you see. Every microscopist will understand me when I say that, in studying these tissues, unless you have a single layer of cells,—and that is often difficult to obtain,—it is almost impossible, where the fibrils and the matrix and the odontoblasts are anywhere near together, to differentiate them under the microscope. So far I have been unable to trace with absolute certainty the fibril running direct from the cell into the dentine and into the tubuli.

I have one of Dr. Andrews's sections in which this fibril is shown in its natural diameter, and of considerable length; and it does not, so far as I can see, join the fibril-cell at all, but comes out directly from an odontoblast. This fibril I speak of almost certainly starts from a blunt-ended cell, and apparently tells a different story from that we have been listening to. But it is much easier to think that the odontoblast forms the fibril and the matrix of the dentine than it is to think there is a double system of cells. At the same time, I candidly confess that I am all at sea.

I have enjoyed these views immensely, and I am satisfied that they advance us another step to a more perfect understanding of the development of the teeth. Dr. Andrews is certainly one of the most advanced of the investigators in this direction.

Dr. Andrews. I simply want to say a few words in regard to the function of protoplasm. We know that there are cells in the stratum Malpighi so exactly alike that it is impossible for one to tell which of these cells is to form an enamel-organ, a hair, or a gland. And yet these cells do form these different tissues. You see they have different functions, and yet are only masses of protoplasm. Another point of interest is in the formation of the cementum just below the neck of the tooth. Here the osteoblasts are losing their identity in becoming the basis-substance; bone-corpuscles are not seen until the deeper portions are reached. It is by the direct calcification of the osteoblasts that the basis-substance of the cementum is formed. And again, in the calcification of the pulp, we find that it has calcified at the expense of its embryonic elements, and I believe that these embryonic elements everywhere surrounding the so-called odontoblasts on the edge of the mature pulp are the cells from which secondary dentine is formed.

Those of you who have looked through the microscope at a calcifying pulp have seen islands of calcified tissue formed from the cells of the pulp. This calcification is at the expense of its elements. I have the utmost respect for the educated judgment of the gentleman who has been named as our mutual friend, and I can sit and listen to him and have confidence in what he has to say on almost any subject in histology. I hope before a great while he may be led by

more careful investigation of this special subject to accept my theory. I can show our friend that it is not the pulling out of the cells that gives them the shape I picture; they exist as pear-shaped cells in the substance of the pulp, as I can demonstrate, surrounded and in close contact with other cells. The coalescing of the fibril-cells will explain the branching appearance spoken of by the gentleman; at least I judge this to be the case. Some of us who have studied striated muscular fiber know that it is possible to bring out the original nuclei of the cells from which the muscular fiber was formed by using the proper reagents. We know that there are cells that form only matrix- or basis-substances—cells that were protoplasm. For instance, if you take a piece of the nail, treat it with caustic potash, and then make an examination of it, you can trace the outlines of the original cells from which the nail was formed. The same may be said in regard to hairs; these are cells forming nothing but a matrix.

So far as protoplasm is concerned, you will find it has various functions.

Dr. Allan. Granting that those fibers are continuous in the formed dentine with the fiber-cells, I think their shape would indicate very strongly that the cell was in a semi-gelatinous condition, and that the fiber was produced by stretching and pulling out the cell and its gradual enlargement.

Dr. Andrews. How about the line of demarkation?

Dr. Allan. The line of demarkation where it is pulled out is continuous. That cell has every indication of what a cell should be. Granting that at first it was a mass of protoplasm in juxtaposition with the forming dentine, when pulled out, by a force insufficient to break it, the fiber clings to the walls of the dentinal tubules, and will stretch out a considerable distance. It seems to me that that would account for the form of those cells as Dr. Andrews has shown them to us. We have the pulp-tissue at one point and the cap of the forming dentine. This is hard and brittle,—so little decalcified by the process that Dr. Andrews uses that it takes the edge off the knife; and if you forcibly separate them from the soft pulp-tissue, I think you will get that condition as a matter of demonstration.

Dr. Andrews. I have the different cells all together; the broad-end cells and the fibril-cells; not pulled out, but in place, with the cells around them, and I can show them to the gentleman.

Dr. Allan. But those which have been shown have all been formed by the forcible separation of the semi-decalcified cap.

Dr. Andrews. I can show them in tissue that has not been separated.

Dr. Allan. You cannot demonstrate this fibril-cell with the cap

in place over the pulp. You have to separate the forming dentine from the pulp before you can demonstrate this fibril-cell.

Dr. Andrews. I can show it with the cap in place. I think it has been pictured by others; I am quite certain that Klein pictures it, and so did Stowell—before he changed his opinion.

Dr. Allan. It is singular that he has never given any reason for changing his opinion.

Dr. Carl Heitzmann. Mr. President: I was invited by you to participate in the discussion to-night, and I will do so very briefly. What Dr. Andrews has demonstrated in the line of development of dental tissues is not new. All has been shown time and again with specimens taken from human beings; but, of course, we have to be thankful to him that he has illustrated the same thing in pigs. What he claims to be novel is in my judgment erroneous. Of course, if you harden the embryos with chromic acid, one per cent., you will have a picture that is worth nothing; but the one-half of one per cent. chromic acid solution, changed every three or four days, will as a rule give very plain outlines. I think that the one specimen where you see with the utmost certainty an odontoblast with its offshoot passing into the dentinal fiber, the latter arising from the center of the base of the odontoblast, the dentine being *in situ* and not detached, is sufficient to show that Dr. Andrews is wrong. Once in a while you certainly do see fibril-cells, but to say that you can trace their fibers alone into the dentine is saying too much. You can directly see that the dentinal fibers arise from the odontoblasts, and not quite so frequently two fibers from the same odontoblast. Three fibers are a little more unusual, and four are rare. I readily understand how the mistake of Dr. Andrews originated in sections of the teeth of pigs. It is perfectly true that in the upper portions of the papilla there are forms identical with what Dr. Andrews describes as fiber-cells; but as you go further down you begin to see the odontoblasts mixed with fiber-cells, and still further you see no fiber-cells,—only odontoblasts.

The strangest thing to me is that Dr. Andrews, who lives in Cambridge, Mass., did not evidently know of a series of articles written by Drs. C. F. W. Bödecker and Carl Heitzmann, the publication of which was begun in the *Independent Practitioner*, in May, 1887, and which are not yet concluded. Here is a proof-sheet of the number for July, 1887, on the development of the dentine. If you will turn to Fig. 13, you will see a picture of the first formed dentine in the human fetus of six months, showing exactly the forms which Dr. Andrews has demonstrated. If you go a little further, you come to a picture on page 348 (Fig. 17) showing the broad odontoblasts with the adjacent dentine, from the fetus of the pig, magnified twelve

hundred diameters; and close to it is Fig. 18, in which fiber-cells only are present. In Fig. 17 we have an odontoblast with a broad base, and what is exceptional, four dentinal fibers arising from the odontoblast. In Fig. 18 there are the pointed odontoblasts, or fiber-cells, more or less spindle-shaped, and each terminating in an elongated point. Is it possible, may I ask, that a publication in Buffalo, which is based on the researches of eight years, made in the United States and in the City of New York, is as unknown to a man in Cambridge as if he were in Egypt? The work has been eight years in progress; and up to within two years I have publicly declared that I did not know much of the development of the dentinal tissues; for I was continually meeting with images that I could not explain. In the last two years Dr. Bödecker has faithfully worked in this line of research, and some discoveries have been made and published.

Dr. Andrews. Permit me to say that I have read everything which has appeared in the journal the gentleman speaks of.

Dr. Heitzmann. Then I am surprised that you do not mention it.

Dr. Andrews. The published illustrations were drawings. Mine are photographs.

Dr. Heitzmann. Suppose that Dr. Andrews were right; we have the dentine and the canaliculi running in perfectly regular intervals. If Dr. Allan knew how to use the microscope properly he would see, if correctly focussed, regular distances between the canaliculi. Suppose Dr. Andrews were right, will he kindly explain to us how the canaliculi and basis-substance are formed?

Dr. Andrews. I thought the pictures and my explanation were so clear that it was impossible to make a mistake. As I stated, the odontoblasts, or flat-ended cells, are masses of membraneless protoplasm; and they coalesce and join, there being no membrane. They are merely vehicles in which the lime-salts are deposited. I would ask if the gentleman has not seen, in the forming cementum, osteoblasts losing their identity in becoming by calcification the basis-substance of the cementum? I think I have seen some of his drawings which show this very plainly.

Dr. Heitzmann. That there are different cells, is a theory I have long since given up. Still, Dr. Andrews is right if he says the functions of different parts of protoplasm are different; that the cement-corpuscle is different from the corpuscles forming the basis-substance; but what reason has he to apply such a theory to the dentine? In one of our drawings there are only pointed odontoblasts. How will he explain the formation of the basis-substance in such an instance? How can he understand the fact that large portions of his specimens are almost destitute of fiber-cells, notwithstanding there are dentinal fibers present?

Dr. Andrews. It seems to me to be very clear that the fibril-cells are there. I might ask Dr. Heitzmann how he explains the fact that there are sometimes large tracts in the dentine without any canaliculi, and without fibers between them? There are large spaces where there are no canaliculi, and yet there is basis-substance. Tomes pictures large areas of dentine in which there are no canaliculi or tubes at all. In this way the cells form only a matrix. It is a simple explanation of the matter to me.

Dr. Heitzmann. I have never seen normal dentine without dentinal canaliculi.

Dr. Andrews. I have seen it formed in the pulp-cavity.

Dr. Heitzmann. What you have shown as dentine was not primary dentine at all; that was secondary dentine. And what you call calcareous globules is nothing but a transverse section of the dentine at its periphery. I do not see how you can explain the formation of territories on your theory. This becomes perfectly intelligible, however, on the ground taken by Dr. Bödecker and myself in the publication I have mentioned. Of course, if things were as you claim,—if there were present broad-based odontoblasts outside of the fiber-cells,—that would account for it; but it is not so. In the specimens shown there are no fiber-cells in many instances.

Dr. Andrews. That is because you cannot see them. There is a fiber running between the cells. They are only seen under the very finest illumination.

Dr. Heitzmann. Do you mean to say that this fiber goes clear through the odontoblast,—through the center?

Dr. Andrews. Not through the center, but sometimes pressed into the edges of the membraneless odontoblasts. That is as it appears to me. I wish only for the truth. If I am wrong, I shall be the first to acknowledge it when convinced of my error.

Dr. Heitzmann. It is just the way we have been doing for years and years. The elder Tomes, in 1846, knew that the odontoblasts arise from rows of medullary corpuscles; and all the Germans who have especially studied the development of the teeth have held the same opinion. The question of where the fiber is from was the main stumbling-stone. Does it first grow without an odontoblast? This would never explain why the dentinal fiber sticks in the center of the odontoblasts, as it really does in many instances.

Dr. Andrews. It may appear to, but does not. Did the gentleman see the line of demarkation between the fibril and the square-ended odontoblast?

Dr. Heitzmann. Certainly.

Dr. Andrews. You will never see that line of demarkation in the fibril-cell. I would like to ask Prof. Heitzmann if he thinks one

cell forms the whole of its line of basis-substance from the enamel to the pulp?

Dr. Heitzmann. No. Can we on any such theory explain how the odontoblasts form the dentine? It is impossible. But if you take the ground we have taken it becomes an easy matter. If I remember rightly, Tomes says the odontoblasts have arisen from a number of coalesced medullary corpuscles. If you give up the idea that these odontoblasts are stable formations, and admit that they are unstable, and visible only during the time when the formation of the dentine is at rest, but when it is going on break up into medullary corpuscles, just as they have arisen from such corpuscles, we can understand the formation of dentine. More than that, it brings the history of the development of the teeth to the level of the development of all other tissues. The odontoblasts are not stable formations, but provisional, and immediately before the forming of the dentine they break up into medullary corpuscles and form what you call calcoglobulin. These corpuscles are changed into basis-substance, whereas the dentinal fiber runs between the medullary corpuscles.

Dr. Allan. It is a very novel idea, to say the least, that protoplasm in one stage of its existence breaks up and goes back into protoplasm. Dr. Heitzmann cannot demonstrate, nor can any living man demonstrate, that there is one particle of difference between what he calls medullary corpuscles or embryonic tissue and the protoplasm which forms the odontoblast as we find it. A stranger theory than that broached by Dr. Heitzmann and Dr. Bödecker, of this changing back from protoplasmic odontoblasts or ameloblasts into embryonic or medullary tissue, was never put in print or stated before a body of scientific men. Protoplasm is protoplasm wherever you find it; and to say that that protoplasm in the ameloblasts changes back from the perfect cell and breaks up into medullary corpuscles, and then re-forms itself into another similar cell, and that that new cell forms the enamel, is about as far-fetched a scientific theory as I ever heard of. It has no basis in fact, and it can have no basis in demonstration, because no lens was ever made that can distinguish protoplasm in one condition from protoplasm in another condition. According to this theory and the figures as published in the *Independent Practitioner*, there is on one side an ameloblast, a mass of protoplasm, and as I believe the cell which secretes the lime-salts. Now, how is it possible, between that place and the point where we find it immediately in contact with the enamel, for the protoplasm to go through the breaking-down and reforming process; and how can the reforming of the ameloblasts of the enamel help us to account for the formation of the enamel or the dentine? I only allude to

the theory to express my utter disapproval of it, and my belief that it has not the slightest basis in fact.

Dr. Heitzmann. Dr. Allan has explained his views on the ameloblasts. A man who still speaks about the secretions of the ameloblasts is antique, and I don't think it is worth while to discuss with him.

Dr. Allan. It is a matter of opinion.

Dr. W. H. Atkinson. I think that all the histologists should do as Dr. Andrews so sweetly said, seek for the truth and the right revelation of the plan of the organization of the human tissues. All those men who have studied embryology know very well that no lens was ever made that would enable us to detect a difference between the elements of the three embryonal sheets from which all the tissues of the body arise. Our old friend, John Hunter, who, though pretty stubborn, was yet clear-headed, said a very wise thing when describing inflammation. He said that inflammation was none other than the return of the tissues to their embryonic condition. Any man who has studied a phlegmon can verify that all the way through. But to say that we shall take every fresh presentment of what seems to be a truth and hold it as an eternal verity, would mark a limit to our progress. It does not do much mischief except when it cannot be answered. We should study together, and not so much alone; and when we feel that we have a true interpretation of a tissue under the microscope, let every one of the class get hold of it and see whether they can agree or not. I admire the modesty and discretion of Prof. Heitzmann which led him to say that we do not yet know how to study the metamorphoses through which the elements go in the formation of tissues, but would rather hold the matter under judgment for a time than to say that it is impossible for us to get from the epiblast, the mesoblast, or the hypoblast all the tissues for the building of the body; that they must be made ready formed, or else the process lies entirely out of the reach of human perception.

This is a subject that has engaged my attention for a long time, but I have not the cheek nor the impudence to say that I know all that has been said upon the subject, or that I have followed all that has been written upon it. I wish that I could eliminate from all the works I have seen the trashy personalities and confusion which have flooded German histology and created differences, and left us without any better interpretation. I have seen nothing that comes so near a satisfactory explanation of the matter as that return of the tissues to their embryonic condition. Now, if you want to be able to form opinions, much less knowledges, you better go to Heitzmann's class for three or four sessions, and then you will begin to get a little bit of foundation on which to say, "I don't know."

On motion of Dr. Francis, a vote of thanks to Dr. Andrews, for his kindness in presenting and explaining his specimens, was passed.

Adjourned. S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

ANNIVERSARY MEETING, FIRST DISTRICT DENTAL SOCIETY.

The First District Dental Society of the State of New York held its nineteenth anniversary meeting at the Masonic Temple, Twenty-third street and Sixth avenue, New York City, on January 16, 17, and 18, 1888.

The president, Dr. W. W. Walker, in the chair.

Afternoon Session.—*Tuesday, January* 17, 1888.

The President. Gentlemen: I have the pleasure of introducing Dr. G. V. Black, of Jacksonville, Ill., who will read a paper entitled "An Examination of the Physical Forces with Reference to the Germ Theory of Decomposition and Disease."

[Dr. Black's paper was published in our March number, and may be found at page 165 of that issue.—Ed. Dental Cosmos.]

Discussion.

Dr. W. Xavier Sudduth. Mr. President and Gentlemen: If you expect to hear from me any objection to the ground taken in the admirable paper which we have just listened to, you will be disappointed. There is only one way to read the story, and that is as Dr. Black has laid it down to you. I can only further elucidate the thought.

Those who are actively engaged in this work in the laboratory, comparing the notes they there obtain with those of clinical cases in practice, can have no other understanding of the subject than the one that Dr. Black has presented this evening. He has emphasized the chemical action of certain agents in producing results favorable to the growth and development of micro-organisms. He has not, however, brought sufficiently into prominence, I think, the wide difference between *life* and *not life*,—between the immaterial and the material. He holds with me, if I mistake not, regarding the necessity of a creative fiat, and the directive function of mind over matter.

Dr. Black has said that life makes use of all forms beneath it. We often also see, apparently, some of the lower forms of life attacking the higher forms. That is only apparent, however, because, as

we know, in the majority of cases, life at its ultimate is impervious to the attacks of these micro-organisms. It is only where pathological conditions are present and the *vis vitæ* has been lowered that these micro-organisms can accomplish their destructive work.

This whole question presents itself to me, tersely stated, in the form of Life vs. Matter. Life may be sacrificed in the attempt to get at matter; but such a result is incidental, and not the primary object sought. It is a well-known fact that in order for assimilation to be accomplished the material to be assimilated must be reduced to ultimate principles. This rule holds good in all forms of matter, whether it be living or non-living. The question may be raised that throughout nature the living prey upon the living. True; but between living matter and assimilation stalks grim death. Then you may say that life may be transplanted. True again; but only to a limited extent, as in transplantation and implantation. The exception itself proves the rule.

The dividing line between life and not life, as found in organic matter, is often wider and more marked yet. The highest form of non-living organized life is found in crystalline formations. The main characteristic of these forms of matter is rest,—inertia; and it is only as we are brought under the influence of some outside agent that any signs of "life," so called, are observed. The very use of this term *life* foreshadows the principal characteristics of life,—namely, motion, activity, aggregation, up-building. These differences between the two are so well understood as not to need further discussion.

Let us turn our attention to the forms that act, jointly or otherwise, to prepare the *not life* for the use of *life*. As we have said, matter in its organized form cannot be used as such to support life, but it must first pass through a preparatory stage previous to being assimilated. Let us go back in imagination to the time in the earth's history when all matter was organized; the gray granite cliffs towering toward the heavens presented only sharp, jagged outlines, just as they had been left after the mighty subterranean convulsions had rent the earth's crust asunder and piled mountain high the eternal hills! No, not eternal! for no sooner were they cast up than a leveling process was begun which will eventually return them to their former position, if not to their previous condition. The principal factors acting in concert to accomplish the disintegration of matter, as the essayist has truly said, are gravity and the dynamic forces of heat, cold, and moisture; and to these may be added electricity, light, and even life itself; which latter plays no little part in helping to prepare the non-living for a more extended production of the living, as we will see more fully illustrated further on.

Let us pause for a moment and consider the action of moisture, heat, cold, and gravitation,—the principal factors acting in this disintegrating process. One, to really appreciate the mighty power of these agents, should visit some of the vast glacier-fields. As I stood upon the summit of the Stockhorn, a year ago last summer, and looked out over almost unbounded snow-fields upon the river of ice known as the Gorner Glacier, extending from the Chima de Jaza in the distance, and including the Monte Rosa and the Weisshorn, with their everlasting crowns of pure white, to the Matterhorn, whose sides are so steep that the almost daily falls of snow upon them find short lodgment, I was more than ever impressed with the latent energy and disintegrating force embodied in these agents, and the term dynamic, as applied to them, seemed more appropriate than ever before. I was carried back in retrospect to the time when all nature was a mass of jagged rocks, upon which fell a mantle of snow; followed, in alternate action, by heat and cold, with the ever-present and acting force of gravitation, which set in motion a chain of events the end of which is not yet. Underneath the vast field of ice at my feet the rocks were ground into powder, as was evidenced by the color of the stream that flowed from the mouth of the glacier. The part played by these forces, however, is not so well illustrated in the glacier as in the avalanches that in August sweep down the sides of the Jungfrau. Here vast areas of solid rock, loosened by the expansion of moisture, acted upon by both heat and cold, are carried down by gravitation, and finally rest at her feet in such a finely-pulverized condition as to be the support of life. Life itself, as we have said, also helps in this process. The chamois as he springs from crag to crag constantly loosens pieces of rock, which, influenced by the great factor of gravitation, are carried on, gradually becoming divided and sub-divided, until at last, finely triturated, they are transformed by the action of the green plant, and support life in his descendants. The shrub on the mountain side, by its growth gradually inserting its tiny rootlets into the crevices in the rock, finally dislodges a portion,—it may be to its own destruction,—and the whole mass is carried on by gravitation to be further disintegrated and to support more abundant and luxurious life below. Not only this, but the plant by its own power of assimilation collects around and to itself moisture, which in turn, acted upon by heat and cold, tends to further the production of those conditions favorable to the support of life.

Consider the conditions prevalent in the vegetable age, when great forests of life, thriving upon the virgin soil, were converting inert matter into a more suitable condition for the support of a yet higher and grander life. This great luxuriance was consolidated

into coal, condensed into gas, converted into saccharine, and locked up for future life. The leaves also of this vast forest of vegetation were converted into manure for the further support of their producers. The accumulated moisture contributed to the establishment of conditions suitable to a higher growth.

We have now seen how vegetable life has by its physical properties contributed toward the fitting of the non-living for the support of the living. There is yet another way in which she acts, and that is chemically. Through her excreta she causes a further disintegration of matter into a condition suitable for assimilation. She digests the very rocks. The rootlets of the plants, as they penetrate the crevices of the rocks, throw out a chemical substance which dissolves the solid granite and makes it tributary to the life process. And so we see how the products of the life of to-day make suitable the conditions for the life of to-morrow; and while it may be destructive to the present life, and often is, yet, when brought in contact with the non-living, which offers no resistance to these disintegrating actions, it furthers the conditions suitable for the next generation.

Then, again, we see how the emanations from plant life contribute to the conditions suitable for the higher or animal life. The plant gives off oxygen, one of its waste products, and this is food for animal life. Animal life throws off carbonic-acid gas, which is food for the plants. The one form of life is contributory to the other. Not so the relations between the not life and life. It is all give upon the part of matter, and all take upon the part of life. A building up, you may say, for what? That it may in turn die? Yes, die, in order to give rise to that higher life, even unto a spiritual one. The one form of life preys upon the other—the higher upon the lower—for a definite end. Each form of life is more or less self-limiting, although self-propagating. Every act, every motion, consumes the vital stuff called life; and you might say that in this we all come sooner or later to a suicidal end.

Examples of the forcible taking of healthy life for the matter contained are all about us and on every hand; but as we ascend in the scale of being they become less numerous. Yet the principle of the stronger preying upon the weaker holds good throughout the scale. Man selects only that which is physically perfect for his food, and so does the lion; but as we pass down the scale we see this nicety of selection dying out, until we find animal life existing on carrion.

This brings us to the consideration of how germ life lives and propagates itself and influences other life. We have seen that life, or matter in its organized condition, does not form a suitable

medium for the support of life. The green plant could not exist until the disintegrating forces had prepared a suitable soil for its roots; nor was there a higher life created until the vegetable life was sufficiently abundant for its support. The granite had to pass through the digestive organs of the plant before it could be taken up by the higher forms of animal life. We have also called attention to the fact that all through nature the stronger prey upon the weaker. This rule holds good for bacterial life as well, and we can trace this aggressive feature of life down to the very lowest forms. This principle established, we are ready to take up the manifestations of this characteristic of life as an etiological factor in the production of disease in man.

Of the long list of pathogenic micro-organisms, there are only a very few which have been positively identified as having the power to attack normal and healthy tissue, and this power for those few is doubted by some mycologists. The mucous membrane of the alimentary canal and the epidermis serve as a protective covering for the more highly vitalized tissues underneath, and are proof to some extent against the encroachment of most of the pathogenic forms of micro-organisms. As a proof of the latter statement, take for example the oral cavity, in which have been discovered some sixty odd different micro-organisms, nineteen of which have been proved to be pathogenic in character when brought into the system under suitable circumstances and conditions,—mark the words,—and yet out of that great number only a few diseases can be directly traced to these micro-organisms; that is, those contained in the mouth. Some few micro-organisms have the property of attacking even living tissue, and preparing it, by depressing the vitality, for further development. Among these are the bacillus of typhoid fever, of cholera, anthrax, glanders, hog cholera, and perhaps a few others may be added, when brought in contact with the tissues of the body under favorable conditions. The same may be said of the gonococcus, staphylococcus, pyogenes albus, aureus and citreus, and several others in this list. Their number is, however, very small in proportion to the great number of micro-organisms that have been called pathogenic. Those that act upon the tissues in which the vitality is lowered are more numerous, and those that are deleterious when brought directly into the circulation are the most numerous of all; although there can be no doubt but that the tissues (white blood-cells) themselves have the power of destroying these agents to a greater or less extent, even when brought into the circulation.

There is no doubt regarding the rôle played by the bacillus of tuberculosis in the disease commonly called consumption; but as to how it acts, and the manner by which it invades the system, and

also what are the opposing forces to its destructive action, we have not yet settled. It is probable that it effects its entrance by means of a diseased or abraded condition of the mucous membrane, which view of the matter strikes me as more sensible than some of the other views that have been brought forward. I look upon the creations of the Almighty as more or less adapted to the conditions in which they are placed; and I find that a healthy mucous membrane is a protective agent against the ever-present and ever-continuing organisms under ordinary conditions. If we maintain right hygienic conditions throughout we will be able to combat preventively the deleterious action of these micro-organisms.

The life of micro-organisms is more or less self-limiting, even as we have seen is the higher life. Micro-organisms develop ptomaines in some instances, alcohol, lactic acid, etc., which act to bring their producer into a condition of temporary rest, or even to disentegration. Confine an individual in a room where he is compelled to breathe over and over again his own emanations, and he kills himself. So it is largely in regard to micro-organisms. Many micro-organisms, by their own products, are not only limited in their activity, but are destroyed. We see this constantly on the dissecting-table. We find scars in the lungs which are no doubt the direct results of tubercular processes which have run their course and then stopped, whereas, but for resistance met at this point, they would perhaps have gone on and caused the death of the individual. These micro-organisms are more or less self-limiting in their action; and by knowing what conditions are necessary to their development we are better able to combat them, by preserving those conditions which will prevent their development.

Four things are essential for the development of any ærobic micro-organism. We must have a living germ, a suitable medium in which it may grow, a suitable temperature, and oxygen. There is another class of micro-organisms, however, that are anærobic in character, and grow without oxygen.

I do not wish to be understood as opposing in any way, shape, or form the progressive work in the study of micro-organisms, nor as desiring to limit one iota their right places as factors in the production of disease; but I do desire to call a halt upon the too enthusiastic following of certain men who are not what you might call actual workers in the field, and who are running wild after bugs. There is no danger of Dr. Black leading you astray in this matter; but there are others, mere hangers-on in the field, who are constantly writing papers and bringing forward new remedies, and carrying this subject beyond its practical and scientific limits. If we cannot move hand-in-hand with our clinical experiences, it

is better to drop the subject entirely. Neither do I want to be understood as depreciating the value of the work done by Dr. Miller, of Berlin. I had the pleasure of meeting him a year ago last summer, and was in his laboratory about a month, and I found him to be a thoroughly scientific man. His work can be relied upon, and what he tells you in regard to the action of the micro-organisms which he has eliminated and described in the production of caries you can depend upon. But that all cases of caries in the mouth are the results of the action of micro-organisms, I most positively deny. A normal tooth, having no break in the continuity of its surface, will resist decay indefinitely. Very few such perfect teeth, however, are found. In the crown of almost every tooth in which the sulci are well marked fissures will be found running down into the tooth in which acids are formed or collected, and thus form foci of decay. That erosion which is found upon the approximal surfaces of teeth, in which there is no break in the continuity, is largely due, not to this bacillus that Dr. Miller has discovered, but to the products of fermentation. Decay, also, that occurs on the cervical margins of teeth is not always due to micro-organisms, but it may be developed from the tissues. A gouty or rheumatic diathesis, or a pathological condition of the system in which an acid secretion results, may produce decay. The failure of fillings on the cervical margins of teeth is more frequently due to the irritating effect of a non-polished filling, whereby granulation tissue is developed, than to micro-organisms. That caries is the result of acid action, no one can doubt; but there are various ways by which acids may be produced in the mouth. In order that micro-organisms may enter upon their work there must be some pathological malformation or defect in the enamel, or coat of mail,—I know that term has been objected to,—that serves as a protective agent against the lodgment and attacks of micro-organisms. If the acid developed in the mouth from any cause does not find a pocket more or less shut off from the action of the saliva, it will be so greatly diluted by the saliva that it will have but little direct effect in the decalcification of the tooth. It is only when the acid is inclosed in the sulci of a tooth that it has much deleterious action upon it.

We do not yet understand the action of lactic acid upon the dental tissues. Dr. Miller, in his researches last year, demonstrated the fact that lactic acid cannot be satisfied with lime-salts. You may take lactic acid and saturate it with carbonate of lime, leaving a quantity at the bottom of the vessel, and if you place a piece of dentine in this saturated solution it will be decalcified. The unlimited power of lactic acid to break down dental tissues is unknown to us as yet. We are on the verge of a line of work which

promises to open our eyes considerably in regard to the decalcifying power of different acids. Prof. Liebreich said it was a point with which he was quite unfamiliar; it had never come to his cognizance before.

If you have a small sulcus in the crown of a tooth which will allow the entrance of germs, and these germs produce lactic acid there, you may have unlimited decay as the result. But if it be an open cavity, into which the saliva can readily flow, the acid will be so diluted that it will have very little deleterious action. This is evident in the mouths of tobacco-chewers, where the great quantity of saliva dilutes the acid and of course hinders its destructive operation.

Our principal object in studying the conditions suitable for the development of germs is that we may be better able to prevent their destructive action by guarding against those conditions favorable to their growth. It is only in this way that we are able to apply the theories we acquire by experiment and experience, and so make solid advancement.

One other point regarding antiseptics in the mouth. The fact must not be lost sight of that all antiseptics are not necessarily germicides. That may sound strange to you, but it is true. I want to speak a word for the poor pulp-canal, which is at the present day flooded with a long list of so-called germicides. If we destroy the conditions upon which germs develop, we are practicing good antiseptic surgery. It is not necessary that we deluge the pulp-canal with bichloride of mercury or other germicides. If we thoroughly desiccate a pulp-canal, and then seal it up, we have done just as good germicidal work as if we had treated it for six months with bichloride of mercury. I believe that in every case where we remove a pulp and seal up a canal thoroughly we put that tooth in as good condition to resist or prevent the development of germs as we could in any other way. From my clinical experience, and from what I have learned of the development and growth of micro-organisms, I cannot help regarding this as as good germicidal work as any, if not the best. Over sixty different micro-organisms have been found in the mouth, and only a few of them have been cultivated and studied. There is here presented a very large field for profitable investigation, and I desire to impress its importance strongly upon your minds. I do not think the dental profession has fully appreciated the importance of this work. You cannot all go into it as a specialty, but you can take up the work that has been done by others, and study it in a practical way. It is the duty of the dental profession to encourage this work and push it forward. It is a line of investigation that is more or less outside of the

medical profession; they do not feel the same interest in it that you do, because there is not so much reputation in it for them. Who has worked upon the pathology of the mouth? Who developed the only germs of importance in the mouth that have been found and cultivated? Dentists in dental practice. You are the men who must encourage this work and pursue these investigations.

Dr. C. T. Stockwell. Mr. President and Gentlemen: I did not expect until Monday morning (yesterday) to be present to-day. Dr. Black was kind enough to send me his paper to run over, but I arrived here so late that I had only yesterday in which to look it over, in connection with my professional duties, and note down a few words upon the subject.

As I have listened to this wonderfully interesting paper by Prof. Black, and to the remarks of the gentleman who has preceded me, and also as my eye runs over this large audience of earnest men, representatives of our profession, who have come up to this Mecca of scientific wisdom from the four quarters of our country; and, more especially, as I have been a witness of the eager interest in and apparent agreement with the essential points of the paper, whose author is an acknowledged expert in the science of which he has spoken,—one who has a right to his opinions by virtue of his long and skillful training in experimental mycology and the allied sciences; when, I say, I am a witness to a spectacle like this, another picture that is indelibly fixed upon my mind persists in forcing itself up beside this of to-day.

The picture so ably drawn and presented to us to-day is one of grand proportions. In it we have arrayed before us, not only the laws and forces of the universe, but the Creator himself is brought before our vision as being related to the germ theory. And you have shown your interest in and appreciation of it by according it your closest attention and hearty applause.

Now, things are brought out into a clearer light ofttimes by virtue of contrasts, and if I may be allowed to divert your attention for a moment only to another picture, I shall do so for the purpose of calling to your attention the fact that "time's wheel" brings about changes in the minds of men,—a sure evidence that our profession is alive and is performing the true functions of life. This other picture was drawn by an amateur artist some five years ago up in an unpretentious town on the banks of the Connecticut River. The occasion was an annual convocation of a little band of country dentists. In accordance with the usual custom, they had invited to be present on this occasion, as the guest of the society, a justly noted professor of world-wide reputation,—a man than whom few

in our profession then stood or stands higher to-day in the estimation of his fellows. This much for the background of the picture. Now the central figures. An humble member of the aforesaid society had collated a series of recently-discovered facts,—the result of several scientific workers,—and in putting them together so as to ascertain the logical deduction of said facts announced his conclusions in relation to the bearing they seemed to have upon the subject of "The Etiology of Dental Caries;" and in answering the question as to "Acids or germs: Which?" the reply is boiled down substantially into the following quotation, viz: "The ever-present germ and bacterial life in all stages of development, together with a *weakened condition of the nervous tissues*, are the two necessary conditions of tooth-decay." This quotation, I say, was the sum and substance of the conclusions arrived at by this venturesome young man, who essayed to bring forward the germ theory as opposed to the then teachings of both literature and college. A few general remarks in opposition to this position were made, and the session was brought to a close.

But the picture is not yet complete. An after-touch constitutes the main feature of interest to-day. An aged member of the society approaches the honored guest and inquires, "What do you think of the paper, sir?" "What do I think of it!" he replies; "why I am surprised at you fellows up here. It is all damned nonsense."

I refer to this instance simply to recall to your minds the general attitude of the profession towards this question of the germ theory no longer than five years ago; and as illustrative of the progressive movement of the profession during this time. At that time the crude—if you please—advancement of the theory was met by general denial, denunciation, 'and ridicule. During this time it has met and conquered its opponents, from the most vigorous denunciations to the mildest arguments in the minds of the most intelligent men; and to-day we have arrayed before us in this masterly way the physical forces as related to it, and working in harmony with it; or rather as showing how this theory fits into the harmony of universal laws. In *this* picture—chemical affinity, gravitation, light, heat, electricity, life, mind, God; in *that*—"damned nonsense."

Positive, strong-minded men are among the world's best products after all; and let me add, in justice to this one, that he was soon found in a different attitude with reference to this question. You will doubtless hear his voice to-day commending and applauding the general line of thought and truth so well and forcibly brought out in this admirable paper. Whether we all agree with the author or not in every particular, every one must commend and applaud the attempt to get *back* and *down* to the basal principles of all

phenomena. It deserves very careful study and thought; and when it shall have been printed such thought and study will, I am sure, be accorded it; and until it is so placed before us, so that we can take in its full and connected scope, it seems to me unjust to attempt even to discuss it. I certainly shall not at this time assume the part of a "disturbing force" that may serve to divert your attention from it.

For one I am sorry that the author contents himself with a simple statement of the "fourth group" of forces,—"Mind, Creator." Our studies of this question are certainly not complete with that group left out of the realm of investigation. When we deal with so simple a matter as sensitive dentine, we see exhibited and have to deal with two of the greatest and most profound realities in the entire universe, viz., life and consciousness. These realities, life and consciousness, constitute the highest study of man. And when in our studies of these we arrive at even an approximate appreciation of what is meant by these two words, we are in a better attitude of mind to apprehend the nature of those forces that come in as "disturbing" elements or "forces." We can then and only then see that life is really the aggressive force. We shall then see that consciousness or mind is the directing agency that impels life to strive to achieve that harmony, that adaptation to environment, which, once acquired to perfection, would mean nothing less than *eternal* life to every organism.

"But life and consciousness are mysteries," some one may say, "that lie beyond the realm and scope of science. This is rather the province of philosophy." But many of our best scientists do not say so. Clifford defines the sphere of science as coextensive with the interests of man. Huxley would make its domain uniform with that of human reason. Accordingly any problem or mystery of which the human mind is conscious lies entirely within the sphere of science. If, therefore, the data in accumulated knowledge are not at hand to solve the problem, or direct evidence cannot be obtained, speculation and inference come legitimately into use. And how often it is that we see science verifying the hypotheses and deductions of those who are so often called idealists or "mere theorists." "Science," according to Prof. Du Bois, "is the verification of the ideal in nature." It is the veritable function of science to unravel the mysteries of nature. And this function she is fulfilling every day. Nowhere is science more active to-day than along the border-line of the physical and psychical; and by it dead, inert, absolutely passive matter has been analyzed out of existence altogether. Living, active force and consciousness are all that are left us as realities, and so, by scientific analysis itself, everything is pushed out into the realm of purely psychical conception.

It follows, then, almost inevitably, that not only the decompositions, but disease as well, are the direct results of *life acting upon life.* As light, heat, and electricity act as disturbing forces on chemical compounds, so different forms of life acting upon other forms of life are the disturbing or modifying forces that awaken consciousness to the fact that the harmony of its environment is encroached upon, and therefore follows the consequent summoning of the resident forces to the processes of *resistance* at the points of attack. In other words, disease is the result of the ceaseless and ever-present strife between organisms of all forms, from microbe to man, in the struggle for individual existence. It is the result of life struggling with life, bringing about as the first phenomenon a *hyper*-vitality, or exalted condition of life, which we term, later on in the series, irritation or inflammation. This is an *abnormal* condition of life, and cannot be long maintained by either organism, and so one or the other organism goes down, the strongest or fittest surviving.

Let me urge, then, that earnest attention and study be given to the great questions of life and consciousness; for in studying these all things else in the universe are included, and universal phenomena becomes our lesson.

Dr. Latimer. Mr. President: I would like to ask a question of Dr. Sudduth with respect to the desiccation of the pulp-canal being sufficient to prevent the reappearance of the bugs; whether it would be likely, if desiccation were all the treatment applied, that the canal might return to a condition that would make it a good habitat for the germs, and they go on with their work?

Dr. Sudduth. I am very glad the gentleman has asked the question. What I meant and what I said was with reference to cases in which you devitalize the pulp yourself, and cases in which the pulp was dead and the pulp-canal had not been opened previous to your treatment. If you put on your rubber-dam, and dry the surrounding territory and antiseptically cleanse it; then take out the pulp and dry the pulp-canal, either with a broach heated red hot, or with hot air, and then fill it with some substance which really *fills* it, there can be no subsequent trouble in that canal. Trouble may occur beyond the apex of the root; but in such cases it can, as a rule, be controlled by antiphlogistic treatment, or counter-irritants applied to the gum. If not, are you afraid to cut through the alveolar process to make an outlet to the surface? It has sometimes seemed to me that some dentists were really afraid to take a bistoury in their hands, but will go on week after week, and in some instances even month after month, treating at a blind abscess, when a little dental surgery would put it on the way to healing in less

than five minutes' time. Rise to the dignity and the privileges afforded you by your title of D.D.S.

Dr. Atkinson. Mr. President and Brethren: I am rather at a disadvantage as compared with the other gentlemen who have spoken upon this subject, and the time is so far spent that I shall not enter deeply into it. I rejoice at the presentments that have been made to-day. The only difference between us, I apprehend, is in the verbiage with which we try to represent what our minds perceive in our investigations. We are standing on prevenient ground, but we are still handicapped by the very names that should convey intelligence. What should we do when people talk about dead substance? Get them on the mourners' bench and pray with them until they are converted. But they must be convicted before they can be converted. Whence come the activities which have been so magnificently poetized before us to-day, from the top of the highest mountain to the depth of the glacier?

Let me give you a few nuggets. Perfect peptones are prepared pabulum,—quiescent food. When the food has been thoroughly commingled by the process of awakening and engagement of the bonds of energy resident either in the primates (atoms) or communicated to them when they are in the sphere of influence of each other, we then have marriage of the bonds and courting ceases; but where we have only courting and not marrying bonds awakened, we may have some differences in this little family that is called microbia. When we talk about poisons we should understand that anything may be, according to the necessity of the feeder, either a food, a poison, or a remedy. We must get away from the false nominations that have kept the world in comparative darkness. If we were more thoroughly erudite in the machinery of language that carries our concepts we would not have so many differences.

When we talk of life as other than the mind we babble nonsense. When we talk of life in the primates throughout the entire combinations of the elements of living organisms, then we are dealing with atom, molecule, corpuscle or cell, tissue, organ, system, and consciousness; and the gentlemen who say that mind is nothing but seriated consciousness (and that is always the life) mistake the order of divine ongoing.

Dr. C. N. Peirce. Mr. Chairman and Gentlemen: I am not on the programme to speak on this subject, but the beauty, the poetry, and the science of the address to which we have listened cannot be passed without some comment. Dr. Black has so impressed upon us in that paper the unyielding force of energy and the instability of matter, that we cannot but feel that we are always changing, and also feel the influence of our environment in producing

certain results. If your Vanderbilts, your Goulds, and your Fields would tear down your tenement houses, and furnish respectable, well-provided, and comfortable structures for good families, you would find your almshouses and your prisons deprived of half their inmates,—so important a factor is the environment in producing poverty and crime.

If we take the refuse from the table and set it in the sun, in a little while its different living organisms become perceptible to the eye, and probably to the olfactories. We put that same material on a vine, and it produces luscious grapes or roses of exquisite colors. The difference in locality makes the difference in results. It is pabulum and environment that give us the variety or style of organisms. And while I most fully sympathize with nearly everything that was said by the eloquent reader of the paper and those who followed him, yet I feel that I must draw a little distinction regarding some of his conclusions. Not that I think there is any real difference were we in accord in our nominations. But when we are told that the presence of organisms in the mouth or in the teeth gives us a clew to the etiology of caries, I feel that we are misleading ourselves. How many of you have seen your efforts to save the teeth in the mouths of young misses almost wholly ineffectual for a long time, while upon a change in life or a change in habitat the teeth cease decaying. This cessation of decay is not because you have made any more successful effort to destroy the micro-organisms; but because a change of condition has destroyed the pabulum or food of those organisms, and without pabulum they cannot exist. It is the presence of their pabulum that brought the organisms into the mouth, and upon it they exist.

How many of you have met with mouths in which the teeth had been neglected and uncared for for years, with decay in many far advanced. The patient comes to you, and you find traces of a black or brown decay, but the teeth are perfectly safe from any further progress of caries. The organisms were there by virtue of the necessary pabulum for their sustenance, the disintegrating food and decaying tooth-structure upon which they feed; but a difference in situation and a difference in the secretions of the mouth have changed the continuity existing between the organic and the inorganic matter of the teeth, and they were no longer an easy prey to the action of the secretions, and therefore offered no pabulum to the micro-organisms, and decay ceased entirely. I think we mislead ourselves when we speak of decay as a result of micro-organisms. These minute beings are the cause of and are omnipresent in decompositions. But the first and important factor in dental caries is the decalcification of the tooth,—the result of an acid which might or

might not be the result of the organisms; but their presence is doubtless the cause of the decomposition of the organic structures after they have lost their vitality.

Wherever we have fermentation we have an acid; that acid dissolves the lime-salts, and then we have what we call decay. No doubt in that disintegrated organic matter from which the lime-salts have been removed there is a pabulum for the low forms of animal life, which thrive upon it and multiply rapidly, whether bacilli, leptothrix, or other varieties; but there is an acid present first, by which the lime-salts are disturbed, followed by the presence of organic matter that offers a pabulum for these low forms of life and but for that pabulum they would not be there; they are but sequences of a cause, and follow in the wake of weakened vitality. The germs are enemies lying in wait to attack the weakened structure as soon as it is prepared for their growth; it matters not where it is, whether in the dead or in the living, the germs are present, and the moment you offer them pabulum they develop by the millions. When you remove the pabulum they are gone.

I spent a year in investigating low forms of organisms, and I drilled into many teeth whose vitality had been destroyed or disturbed and the pulps had died; teeth that were sound so far as their structure was concerned; and in drilling into those pulps I found them offensive, full of organic matter, and full of a variety of organisms. It shows that the organisms are ever present, and only waiting for a weakened vitality to prepare a pabulum for them, and they attack the structure. It is perfectly true that they are present and active in the disintegration of tissue; but they do not devitalize it. The pulp died by virtue of loss of connection with the nervous and arterial systems, and being dead, offered a food that led to the development of the organisms. That is my firm conviction. I think I have watched decay in the teeth of my patients as closely and thoroughly as anyone, and I feel convinced that, if I can place a mouth in such a condition that there is no disturbing element present that will decalcify the enamel, the teeth will not decay. If there is no secretion that will disturb the enamel there will be no decay; or if the enamel should be disturbed, and there is no pabulum left, there will still be no decay. Give me a mouth pure and free, and I have no hesitation in drilling a hole in the tooth and placing in it any kind of micro-organism without fear of decay, provided the patient is in good health and condition.

Another point. I think Dr. Black told us there were organisms that took hold of living matter. It is so to all appearances; but how do we know what changes have taken place in that living matter which enable them to take hold of it? I feed myself with

rich food that cannot be appropriated, and so place my system in an abnormal condition, and though I am not conscious of any dead or dying matter in the system, I have placed it in a condition that is favorable to the development of germs, and while there may be no loss of vitality, yet there is an abnormality that offers them a home and food.

Dr. E. La Rue Vansant. Mr. President and Gentlemen of the Society: It certainly was not my intention to have anything to say on this paper, and I will, with your permission, rather attack the subject from a different point of view,—that is to say, a more pathological point of view.

I think it was Dr. Sudduth who said caries could take place without the action of bacteria; and he spoke of the limited power of bacteria in the teeth, and seemed to infer that their power was limited by ptomaines developed, which in this case I understood to be ptomaines of lactic acid. I would draw attention to the fact that in laboratory work, in the culture of substances, the cultivation of bacteria must be made nearly or quite alkaline. Bacteria grow very badly in any acid culture. All the tubes are made alkaline in their contents before we cultivate bacteria.

Again, it seemed to be assumed very positively that the action of micro-organisms upon the teeth was due to ptomaines developed by them. As regards the teeth, I do not know so much; but I do know this,—that it is an open question as to how the bacteria exert their influence upon the system in disease; whether the bacteria themselves are the active working agents, or whether the chemical changes that take place in the fluids or the tissues in which they are found act as ptomaines or poison to the system; or whether they develop certain excreta from themselves which act as poisons, is altogether debatable ground.

There is still one other point that came to my mind when listening to Dr. Black,—the practical point he made in exhorting the society to make further researches regarding the origin and action of micro-organisms, and how to guard against them. The form of organism which you mostly come in contact with is the bacteria of decomposition. One day, as I was walking through the wards of a hospital in London to which Dr. Jos. Lister is attached, he made a remark which is a very true one,—that it is a fortunate thing for surgeons that the bacteria of decomposition are not so resistant and tenacious of life as many other kinds of bacteria, as the bacteria of anthrax, the bacteria of tuberculosis, etc. The bacteria of decomposition are easily destroyed.

Dr. Black. I shall say but a few words in closing this discussion. In regard to the discussion of the paper, I will say that it has been

my endeavor to use such words as would be understood by persons habitually speaking English; and I think that when I use the term "dead" most people know what I mean; and so with other terms that I have used. I do not always agree with Webster—at least Webster sometimes disagrees with me—in spelling, but I generally accept him in definitions of words.

A word in regard to microbes found in places hidden away in bodies. I have defined that in previous papers. We have a product of inoculation, you may say, or of infection from the surface; and we may have infection or infarction through the blood streams, or through the lymphatic streams; and in this way a broken limb, where the skin has not been broken, may suppurate; but we know how rarely that occurs. We can produce it in rabbits by injecting the pus-forming microbe into the blood. We know just how it occurs.

I do not think I need to go into a discussion of the primary cause or the sequence of all this.

A word in regard to the microbes of the mouth. The saliva is a very good culture medium. Wherever we go we take into the mouth the germs that are floating in the air, and they develop in the saliva. But few of the organisms growing in the mouth do any harm; almost all the microbes that exist in the air and in the mouth live there for a few hours and then pass away. But we do find a certain series of forms that exist there habitually, and those are what we want to study, and those are what I have been cultivating. I have cultivated the leptothrix bacillus artificially. I find it to be a true spore-forming microbe. It cannot be cultivated in ordinary gelatin; but may be cultivated successfully in albumen after digesting it with pepsin. When it does grow it makes a wonderful growth,—a perfect forest. Several other microbes of the mouth I have thus succeeded in cultivating which will not grow in gelatin. We need some improved mode of cultivation very badly. It has been demonstrated, I think, thoroughly and completely that there are many forms of microbes that cannot be cultivated artificially by the present means.

Adjourned to Tuesday evening, at 8 o'clock.

Evening Session.—*Tuesday, January* 17, 1888.

Dr. Frank Abbott was introduced, and read a paper entitled "Contributions to the Knowledge of Tumors of the Jaws."

[This paper was published in our March number, and may be found at page 133 of that issue.—Ed. Dental Cosmos.]

The President. Gentlemen: This paper is now open for discussion. I will call upon Dr. Andrews, of Cambridge, Mass.

Discussion.

Dr. R. R. Andrews. Mr. President and Gentlemen: I have but a few words to say. I am here in a rather false position. I received an invitation from your president to consider this paper, and I told him that I should be very glad to do what I could. I called upon the reader of the paper some three weeks ago, and requested that I might have a copy to study, as the subject is entirely foreign to any of my own studies. I was informed at that time that the senior writer of the paper preferred that it should not leave the hands of Prof. Abbott. After considering the matter, I wrote to your president declining, under the circumstances, to take part in the discussion. He wrote in reply that he was sorry, but it was late, and my name had already appeared in some of the journals in connection with the discussion of the paper. I called on Dr. Abbott again, and he read a portion of the paper to me, for perhaps ten minutes, giving a classification of the different tumors so far as he could with the little time he had; and I saw that it was on a subject that I knew so little about that I could not consider the matter, and I have not. I wish to say, however, that I am somewhat acquainted with the appearance of tissues as shown by the microscope, and while I cannot say too much in praise of the care and labor spent on this paper, we must take into consideration the fact that these pictures are drawings, and do not represent the appearance of the tissues as they are seen under the microscope. It is perhaps as near as can be obtained with the pencil.

Regarding the reticulum represented by Prof. Heitzmann, I will say that, with the best photo-micrographs that I have ever made, I have never been able to show the reticulum as it has been shown here this evening. My whole study with the microscope has been in the direction of the development of the tissues, and not from a pathological standpoint. I am sorry that I cannot do better, but under the circumstances I do not see how I can.

Dr. Abbott. In answer to what Dr. Andrews has said, I will say that he did call upon me, and he heard a portion of the paper as he has stated. He told me at that time that he expected to be in New York two or three days before this meeting occurred, when he would have ample time to look over the paper. I told him I would gladly read the paper to him, show him the drawings, and explain the whole thing as I went along. But Dr. Andrews has not had the time to do so, and the result is that he has not studied the paper as he should. It has been a very difficult thing to get the specimens together and the work done so that it should be in anything like presentable shape, and it is only recently that I have gotten the paper into the shape in which I have read it. It has really not been ready to send anywhere or to show to anyone.

The President. I will call upon Dr. Sudduth, of Philadelphia. I suppose he is in the same predicament as Dr. Andrews.

Dr. W. Xavier Sudduth. Mr. President and Gentlemen: I am necessarily placed in a rather peculiar position in discussing this paper. As I have always said, and I desire to say it again, Dr. Heitzmann is an elegant draughtsman. No one doubts his ability in that direction. You have had evidence of it in the pictures shown on the screen. But these pictures are not actual slides, nor even photographs of them. They are photographs of drawings, and you must take them for what they are worth. In my work in histology I have tried to eliminate this matter of the "personal equation" in the illustration of the points I desired to bring out. I can draw fairly, but not as well as Dr. Heitzmann. In my drawings I try to represent what I see under the microscope, but I must admit that anyone familiar with my work can trace all through it Sudduth's "ear-marks," and that is why in my illustrations for the "American System of Dentistry," and also for my class illustrations, I have had recourse to photo-micrographs; and when I say that Dr. Heitzmann is troubled in the same way I speak from experience. He has got so used to drawing reticular structure that it is indelibly photographed upon his retina, and when he sits down to make a drawing it finds its way into the picture, and I call it Heitzmann's "ear-marks," and expect to see it in all his drawings.

Now, the value of drawings as illustrations depends upon the ability of the draughtsman and his power to represent an unbiassed interpretation of what he sees under the microscope, premising of course that he is a good microscopist. Nevertheless, drawings are at best the handiwork of the man who makes them, and as such must always be subject to the same criticism as would any other combined production of brain and hands.

The illustrations shown upon the screen were very good indeed, considered as works of art. They are, however, very much inferior to the originals, as Dr. Heitzmann must himself admit unless he thinks perhaps that he can improve upon nature. Such means of illustrating papers puts the persons who are to discuss them at a very great disadvantage. If the actual slides or even photographs of them had been thrown upon the screen we could then have had an opportunity to judge for ourselves. As it is, however, we are asked to look through Dr. Heitzmann's eyes, reticulum and all, and concur in his diagnosis. If we had had the opportunity of studying the slides before the convention, we could have formed diagnoses for ourselves, and been ready to discuss this paper. That privilege, however, was not accorded us; and right here I desire to say that Dr. Abbott was not to blame in the matter, for, as he wrote me, he

was perfectly willing to allow me the privilege of studying the slides, but that Dr. Heitzmann was opposed to allowing them to leave New York.

The essayist has introduced the term "myeloma" to represent a certain class of tumors. The definition given for the term is a tissue or tissues composed of embryonal corpuscles. The term is not *new*, having been long previously used as an adjective to modify the term sarcoma, as "myeloid sarcoma." There are several varieties of sarcoma, and these variations have been designated in a very simple manner by common words, such as "round-celled sarcomata," "spindle-celled sarcomata," or "giant-celled sarcomata," etc. The term "sarcoma" means "like flesh," and is used to represent those tumors of which granulation tissue, or what is known as "proud flesh," is the common type, and was first introduced by Virchow. Now, "fleisch," the German for flesh, has a somewhat different signification in the original than we give to it. The definition as given by Koehler is "flesh," or "brawn," and the word muscle is given as a synonym. A still further indication as to the use of the word in the original is found in the word "fleisch-wildes," meaning proud flesh. The definition of the word "brawn," according to Webster, is the fleshy part of the body. The term has also the signification of "raw." As these are the principal characteristics of the class of tumors known as sarcomata, the name will be seen to apply more aptly than would at first seem. Then, again, our aim should be to simplify rather than to add to the already overburdened condition of our scientific literature. Another point should also be taken into consideration in bringing a new term into use, and that is that, unless it is indorsed by or emanates from some one of the eminent authorities, such as Virchow, Koch, Pasteur, or others of like ability, it will not be likely to come into general acceptance.

I have had the pleasure recently of having some very pleasant interviews with Dr. Abbott, and I find that we very nearly agree regarding the physiological and morphological appearances of tissues. A great deal of the misunderstanding that has arisen between us has lain in the different use of terms. I have adhered to the existing nomenclature, while he has introduced new terms. If Dr. Abbott would confine himself to the existing nomenclature, he would be more easily understood, and would meet with less opposition, but when he calls black white, and gets Dr. Heitzmann to draw it for him, no wonder that we fail to recognize it, and oppose him. Now, I have said this in the kindest of spirit, and with a view of a better understanding of each other's views. Dr. Atkinson said last year, "It is the misuse of terms that gets us by the ears," and I fully agree with the sentiment. The illustrations on the screen

were beautiful representations of tissues. Regarding their accuracy as compared with the originals, I cannot judge, for I have not had the opportunity of comparing them. In the main I concur in the diagnosis made.

There are several exceptions, however, where, if the drawings are correct, the diagnoses were wrong. Take the first one, for instance, which was diagnosed as a myxoma. The term "myxoma" is applied to mucous tissues, the most common illustration of which is found in the umbilical cord. The cells are branching, fusiform, or stellate in form, and lie in a homogeneous matrix or basis-substance. Such tumors are very soft, and contain but few vessels, and it is by reason of the latter fact that they have a decided tendency to break down. They are light-colored growths, and are seldom found alone, but as complications of some other variety of tumor. The explanation given of this tumor (No. 1) does not compare at all with the generally accepted understanding of myxomatous growths. In the first place, the essayist said that it was of a blood-red color. Myxomatous tissue is always translucent, and even at times transparent.

In the illustration thrown upon the screen the immense number of dilated capillary vessels formed a marked feature. Such a condition is not at all characteristic of myxoma. Then, again, the cells shown in the body of the tumor were round or fusiform, and had none of the features of myxomatous cells, but, on the other hand, were those of sarcomatous tissue. When we take into consideration the color of the tumor (blood-red), its highly vascular character and its marked tendency to recur, we should unhesitatingly pronounce it an *angio-sarcoma, or nævis.* Specimen No. 2, as the essayist said, was taken from another portion of the same tumor from which illustration No. 1 was obtained. Now, that strikes me as rather contradictory. I am generally satisfied to get one diagnosis from one tumor; if I find more than one element in the same tumor, I combine them to form one diagnosis. In the second representation the tissues are magnified considerably higher, and we can see the form of the cells, which leaves no doubt as to their character, and the correctness of the diagnosis of an angio-sarcoma. The diagnosis of fibroma, in specimen No. 3, was so markedly erroneous that I cannot let it pass. If the drawing represents at all near what the tissue was, it cannot be a fibroma, because of the multinuclear bodies which the essayist says represent giant cells. Such bodies are never seen in fibromata. I am surprised that such a mistake should have been made by Dr. Heitzmann, with his thirty years' experience as a microscopist behind him. Specimen No. 4 was evidently correctly diagnosed as a fibroma. The following illustrations, Nos. 5, 6, and 7, were not thrown on the screen so as to correspond with the text of

the paper, but I recognized one as a probable lipoma, and the other two as angiomata, simple and cavernous. I desire to call attention to specimen No. 8, which was correctly diagnosed, and from the drawing I should say was a typical myxo-sarcoma, and proves the correctness of my position in stating that the diagnosis of specimen No. 1 was incorrect. The two specimens have nothing in common, yet the essayist has seen fit to diagnose one a myxoma, and the other a myxo-myeloma, or sarcoma, as is generally understood. In No. 8 typical branching, fusiform, and spindle cells are shown, which I have previously pointed out as characteristic of myxomatous tissue, while those shown in specimen No. 1 were round. The wide difference in the nature of the homogeneous basement-substance should also be remarked. In No. 8 it is shown as granular, which is entirely correct for that kind of tissue.

The diagnosis of No. 9, of fibro-myeloma, is in all probability correct. The generally accepted term, however, is giant-cell sarcoma. I noticed one striking feature in what I took to be a representation of a cross-section of a blood-vessel in one of the multinuclear bodies. I have never in all my experience seen anything of a like nature before; neither do I remember of ever having seen such a condition represented in any of the text-books on pathology. I presume that such was the condition of the tissues, or Dr. Heitzmann would not have drawn it after his many protestations as to the reliability of his interpretations of what he sees under the microscope. Regarding No. 10, I am at a loss as to what it is, having nothing but the drawing to judge from. It has more the appearance of a scirrhous carcinoma than anything else. It certainly has none of the characteristics of fibro-myeloma or sarcoma, as diagnosed by the essayist. It might from its location be a simple fibroma, and the granular bodies shown be cross-sections of bands or sheets of connective tissue. Such an arrangement, however, of the connective-tissue fibers is seldom met with.

Of No. 11 I have nothing to say, as little more than the bone-tissue could be made out.

No. 12, diagnosed as globo-myeloma, is evidently, from the description and the drawing thrown on the screen, a large, round-celled sarcoma, which concurs with the diagnosis made, with the exception of the use of the terms, and I leave to the audience to judge as between the applicability and simplicity of the term in use and the one introduced by the essayist.

Of No. 13 I should say that it was more probably a melano-sarcoma rather than as diagnosed; but here again comes in the matter of the personal equation in the drawings. No. 14 was correctly diagnosed as an epithelioma; No. 15, also, as a medullary carcinoma.

Dr. Abbott deserves a great deal of credit for the large number of specimens that he has brought before us this evening. We all know that he is a very busy man, and those of us who are engaged in histological work know also that it takes a great deal of time, labor, and money to do progressive work of this nature. He has collected, I understand, seventeen tumors of the mouth, five of which are myelomas, or sarcomas, as we call them. As you all know, I have been working in pathology for several years, and I have given more or less attention to the study of tumors of this class. I have worked in all the principal laboratories in this country and in Europe, and I have gotten together thirty-two individual tumors of the jaws, mouth, and associate parts, besides quite a number of tumors of the face. My colleague, Dr. Vansant, has also incidentally collected thirteen, so that our laboratory represents forty-four individual specimens of tumors of the mouth. We have those specimens here to-night, and also some microscopes which Dr. Allan has been kind enough to furnish for the occasion, and, if you care to remain after the close of the meeting for a few minutes, we shall be only too glad to show them to you.

Dr. T. W. Brophy. Mr. President, Ladies, and Gentlemen: About three weeks ago I received a letter from your president announcing that I was to participate in the discussion of a paper the subject of which, as it appears, was to be "Contributions to the Knowledge of Tumors of the Jaws." I wrote to him that it was doubtful about my being able to come to New York; but a week ago Sunday last I concluded to come. I find myself in about the position of Prof. Andrews. I had no knowledge of the contents of the paper until yesterday, and then Prof. Abbott kindly read a portion of it to me, and I found that it was on the microscopical work leading to examinations of these growths after their removal. I am not prepared to discuss this paper in a manner that I feel its importance requires. My dealings with these tumors have been largely from a clinical standpoint, and I am somewhat familiar with their appearance under the microscope; but without some preparation more than I have had during the period of twenty-four hours, I do not feel that I can discuss the paper with the degree of intelligence that its importance demands.

I do not quite agree with my friend, Dr. Sudduth, in regard to the name which Prof. Abbott has given to the tumor that has been known as a sarcoma, in changing it to myeloma. We need names that will indicate as far as possible exactly what we have. It is true that we must qualify this term by the use of adjectives, but the name that he gives is, in my judgment, a more proper one than the old name which it has so long borne. Still, the objection that

has been made by Dr. Sudduth is perhaps a good one, that it requires a long period of time to get the new name fixed in the minds of investigators. It at first leads to confusion, but that is only the history of the change of many other terms. When names are changed, and we become familiar with them, we like them better if they are more appropriate than those which were formerly used.

Yes, Dr. Abbott deserves great credit for the work he has done in the preparation of this paper. While I do not wish to criticise his exhibition, I think that, had the slides been used, the accuracy of the representations would have been more pronounced and unquestionable. There is no question at all about our ability to throw slides on the screen by the use of the stereopticon and produce pictures or images of sufficient size to criticise intelligently.

I would like to have this question, if you will permit me to digress, considered from a little different standpoint; and I think that the gentlemen who are engaged in this work—Prof. Abbott, Prof. Andrews, Dr. Sudduth, and Dr. Heitzmann, who are working constantly with the microscope—may be able to do something more than explain the pathological nature of these growths. We want to know the causes of these affections; we want to know how to detect them in the beginning of their growth; we want to know something by which we can benefit humanity more than can be done by examining slides and becoming familiar with conditions that we do not strictly understand; and I look to the gentlemen who are engaged in this kind of work to bring us, another year, something that will be absolutely new, and that will enable us to understand more, not only of the pathology, but of the therapeutics, and the agents to be employed in eradicating these affections, which are to-day attracting the attention of the best minds in the medical profession throughout the entire world. It is so because it seems that distinguished men have been during the past few years more afflicted with this kind of disease than heretofore, and that has excited the interest not only of the medical profession but the laity, and the entire civilized world looks to the medical profession to bring to the relief of these people a remedy which will prove, if possible, a specific.

Mr. President, I apologize to you and to the society for not being able to take this subject in hand and discuss it in the manner in which I think it should be discussed. I thank you.

Dr. E. La Rue Vansant. Mr. President, Ladies, and Gentlemen: In showing these drawings to-night the gentlemen who have read this paper before you have indeed done wrong. I only follow the remarks of the other gentlemen in saying that a drawing of any sort cannot be looked upon with the degree of certainty that photographs

can. I wish to call attention to the fact that some of these were so drawn that, if the diagnoses presented to us by the gentleman are correct, the drawings are incorrect. As specimen No. 10 was shown, I noted that it was diagnosed as a fibro-myeloma. If the drawing is correct, it is doubtless a fibroma. The so-called medullary cells are mere cross-sections of bundles of connective-tissue cells. Several of the other drawings have been criticised, and justly, so far as the drawings seem to show.

I have brought with me here to-night a number of specimens of tumors of the jaws and associate parts. Dr. Sudduth has mentioned some thirteen of them; and without reading the list over now, I will simply show them after the meeting to those who are interested.

I want also to say a few words about something that was said by the reader of the paper about some of these malignant tumors being caused by traumatism. He based his opinion, that they were traumatic, upon the fact that in some of them he saw pigment. I wish to call your attention to the fact that pigment may be absorbed; that it does not necessarily remain in the tissues, and that a trauma of such old date as to produce a tumor such as shown would not be likely to show pigment. The principal one exhibited here with the pigment is not necessarily of traumatic origin on that account.

Some remarks were also made this evening regarding the change of connective-tissue cells into epithelial cells. I understand it is an old story before this society, and I do not wish to enter into it any more than to read you a few words said by Adolph Virchow, at a recent meeting of the Medical Society in Berlin. He was reading a paper, "Ueber Pachydermia Laryngis," in which he criticised this theory of the change of connective-tissue cells into epithelial cells, and said, "I have a strong conviction that not a single corpuscle goes from connective-tissue into the epithelial layer, and that all that is found in the epithelium comes from independent growth of the epithelial cells." I quote his opinion, and a mere mention of his name is sufficient to settle the authority.

These specimens are at the disposal of the society, and I shall be very happy to give the histories connected with them so far as I have them, and personally demonstrate each specimen that I have described.

Dr. Atkinson. A word to our young men who are beginning, and to the old men who are rooted in their own conceptions so deeply that they are not able to get out of them. Go back to the two semens, the confluence of which produces a germ. What are the first appearances? The first appearance is a blank uniformity throughout the whole. After this ferment has ceased to act, by the fulfillment of its mission, then what do we see? Segmentation. It

has been called the product of three embryonal sheets,—the epiblast, the hypoblast, and the mesoblast. That is not true. It is one mass of indifferent bodies called epithelial—indifferent and embryonal. There are originally but two sheets; and not two, for it is one continuity enfolded upon itself, so as to produce what is called hypoblast, between which and the epiblast, which is the outside layer, constituting what is called the embryonal sheets, the mesoblast arises, —all made up of indifferent corpuscles, incapable of being discriminated by any microscopical examination, and which can only be distinguished by their location in the embryon.

I am justified in these statements by the investigation in the case of the Crown Prince of Germany, in which there is no substantial or satisfactory conclusion arrived at by the physicians who have made laborious examinations. Even Virchow himself—as well as all the investigators who have had charge of the case—has been compelled to hedge and dodge the question. They have not come out like men and said, "I know in part, and what I do know I will tell you as nearly as it is possible for one man's apprehension of a thing to be conveyed to another mind."

Be careful of your classification of tissue. Tissue means web. Webs are made up of strings, threads, and all that; and all this must be taken into account before we can know much about it. My heart warmed towards Dr. Sudduth when he spoke of our getting hold of the truth as it is. When we get down to bed-rock and alphabetical presentations of principles, we may be able to formulate postulates from which to reason accurately in our investigations. God forbid that I should discourage any man from investigation. I rejoice that there are men who are willing to spend their time in these researches, unprofitable to any man but him who is inspired to know the truth for himself, that he may give it to the world!

Dr. G. V. Black. Mr. President and Gentlemen: It was not my intention to say anything in this discussion this evening, although the subject gone over in the paper is one with which I am very familiar. I have spent a great deal of time in the consideration of these tumors, not only clinically, but in the preparation and study of microscopic sections.

I want to say a word in regard to the drawings. In a very small way I am a picture-maker myself, and I think I know something of the value of that mode of illustration. As the world goes, very few of us can make that study of the slides that is necessary to a formation of just conclusions. We who undertake to make pictures simply do the best we can in placing upon paper illustrations of what we have seen, and they should be taken for that,—and nothing else; not as accurate representations. All drawings made with

pencil or ink are more or less diagramatic, I do not care who makes them, and they may represent more or less that which the author of the drawings regards as important, and hold back that which he regards as less important. Necessarily it cannot be otherwise. A large proportion of the medical and dental professions owe much of that which they really know of the tissues to drawings. Now, just as fast as we can reach the better illustrations by means of the camera, with the picture thrown from the slide upon the screen, I think we should do so; but we have hardly worked up to that sufficiently yet. Many of the pictures shown are good. My friend, Dr. Andrews, and others who are working at this subject, I fully think will in the near future give us pictures that will be better than any drawing that any man can make; and I am glad to see them working in that direction. They certainly will be truthful representations if we can get the focussing down to a point so as to make good pictures upon the screen. Wonderful improvements have been made recently in that direction by the work of our friend.

A word in regard to the nomenclature. In my study of tumors I have fallen out terribly with the nomenclature. There is no other subject of which I have knowledge in medicine that is so completely overloaded with terms as that of tumors. I don't wonder that it is a terror to the students who undertake to study these tumors with the wonderful nomenclature that has been given to them. In my opinion two or three principal words, preceded by descriptive adjectives, would be better than any nomenclature that I have yet seen. Let each man put in his adjective as the particular type or character of the tumor may require. Only a few terms are necessary to describe the particular types of tissue, and then the particular character of the tumor may be described by adjectives. The student can soon learn those easily and readily. I would obliterate the whole catalogue of names, and begin again with these few simple terms. All of these tumors grow so imperceptibly into each other that these terms simply tend to confuse.

Dr. Heitzmann. Mr. President and Gentlemen: I am to close the discussion; but before I do so let me review what has been said. First, Dr. Andrews claims that he cannot see the reticulum. That is not the fault of the reticulum, I am sure. The reticulum has been seen by hundreds of people in my laboratory, and by many other people in Europe; and some persons have drawn the reticulum correctly and afterwards publicly denied that they had seen it. Where is the fault? It is in the method of mounting the specimens. If you use Canada balsam, or glycerin-gelatin, as Dr. Andrews does, you do not get a good specimen for examination. I have seen some of Dr. Andrews's specimens, and I can speak of them from

knowledge. His photographs, made directly from specimens, are by no means satisfactory. I have seen some of them recently. The odontoblasts show the reticulum much blurred, and everything else blurred. If that is a demonstration of microscopical specimens, I give it up. There is an electric microscope of Stricker that I have been striving for three years to use in these examinations, but I cannot make it work, for the want of a 40-ampère dynamo machine.

Dr. Sudduth brings forth his specimens of tumors of the mouth. He claims he has thirty-two, and that there are thirteen more. What have they to do with this subject? Surely nothing. If he brings specimens of tumors of the palate, the tongue, the pharynx, the larynx, and so on, what has all that to do with tumors of the jaws? Our topic was entirely confined to tumors of the jaws; not of the mouth, nor of the face; therefore, if he has demonstrated tumors from other localities, it has no connection with the subject. Dr. Sudduth of course attacks the drawings in a nice, kind, and gentlemanly way, which really makes me smile, gentlemen. For the last thirty years, to say the least, I have, if I have anything, had the repute of being a good, honest, faithful draughtsman. There are books published in Vienna illustrated with my own anatomical drawings, which have the largest circulation throughout Europe; and there are large volumes upon skin diseases containing illustrations of my own. In twenty years there has been scarcely a publication made in the line of microscopy in Vienna that has not been illustrated by myself. A person who goes through such a school as I have gone through must become a conscientious and accurate draughtsman. I admit that a certain degree of personality will be brought into every drawing. But will you question that these drawings were made with the utmost accuracy? Many gentlemen have been in my laboratory and have seen me working,—I do not wish to mention names,—and it is too funny to hear a gentleman doubt the accuracy of my drawings. I am perfectly at a loss to make a line unless I have the specimen before me. Besides that, will anybody maintain, or believe, or think it possible that an inaccurate drawing would have met the approval of my co-worker, Dr. Abbott? If I draw a reticulum as I have seen it, would anybody think that Dr. Abbott would admit that reticulum if he could not see it himself? Do you think you could make Dr. Abbott believe he sees something that he does not see? It is too funny! Anybody who knows Dr. Abbott and knows his ways would ridicule such an idea. Do you believe he would allow me to make a drawing of something he could not see, and illustrate it here in public before the First District Dental Society with his indorsement? Dr. Abbott

would not do that; neither would Dr. Bödecker, nor any other gentleman.

I can assure you that this reticulum is easily seen. Dr. William Carr, whose honesty and ability I suppose nobody will doubt, demonstrated that reticulum last year by a novel method in his studies. I was amazed to see Dr. Carr working, and after two or three hours accurately draw the reticulum in the basis-substance, and make a sketch of it, although he was no draughtsman at all. Would you say that I made Dr Carr believe that reticulum was there? That won't do, gentlemen. I do not think I could make Dr. Carr believe anything he did not see himself.

The term myeloma has been objected to by Dr. Brophy, who asserted that it was no better than sarcoma. The latter name is inappropriate because it means fleshy, therefore a fleshy tumor. Anyone who has ever seen a sarcoma will have noticed that it has no resemblance to flesh; besides it is the name which was given benignant tumors. It is of course good, and has a large circulation just now, but that is no proof that it is absolutely correct. The word myeloma means a medullary tumor, and I think it is the superior term. Suppose you talk about a sarcoma,—who will contradict you? Not I. We are acquainted with both terms. I make use of the word myeloma because I prefer it to sarcoma. It is true that our nomenclature is too much confused and split up into details, and we should aim to simplify it. That is the real objection raised by Dr. Atkinson against microscopy. If, as he says, in the Crown Prince's case things are mixed up and at fault, he should not blame the microscope. I am sure Dr. Atkinson does not mean to do that. The fault lies with the men just as much as with the microscope. Consider the conditions under which the microscopist works. If he gets a minute piece of tissue scraped off the edge of the tumor for examination, and finds it has certain features, and it is shown afterwards that those features are not correct as to the whole tumor, is he to be blamed? I always say that in such a case I found this and that, and that covers the ground. The mass of the tumor may be different. That there occur combinations of different characteristics in one tumor, every one who has worked in this direction knows.

Dr. Brophy kindly maintained that all this work is of very little value if you cannot learn how to kill the tumors. Of course we want to learn how to cure tumors, but how will you learn to do that unless you know how the tumor looks, what it is, and how it originates? Theoretical knowledge is just as necessary as clinical knowledge. The scientific physician who is thoroughly educated, theoretically as well as practically, will be more practical and more

successful than the rough, empirical practitioner who does things because he has seen them done by other people. A man who has little or no theoretical knowledge is like the Indian medicine-man, who does everything by empiricism. Dr. Brophy is right in saying that our main aim is the relief of suffering mankind; but I maintain that this aim is only reached through very hard work, by the assistance of all the appliances, among which ranks first the microscope. We must have a certain amount of knowledge before we come to the point where we can kill disease or cure it, and you may be sure that that point will have to be reached through such investigations as these. You have heard that bacilli have been found in cancer; and it is some time since Koch discovered the bacillus in tuberculosis. But can we kill that disease? Not a bit. In the last five years our knowledge of bacilli has spread immensely; and we may have learned how to prevent disease to some extent, —but to cure it, not much! There is a higher aim than curing, and that is preventing, disease. And to prevent disease you must pursue scientific researches and acquire theoretical knowledge, and in these researches you need the microscope.

Adjourned till 2 P.M., January 18.

B. C. NASH, D.D.S., *Secretary.*

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

THE regular meeting of the Odontological Society of Pennsylvania was held Saturday evening, January 7, 1888, at Justi's rooms, Thirteenth and Arch streets, Philadelphia, President E. C. Kirk in the chair.

Dr. D. N. McQuillen, of the Clinic Committee, presented the following report:

There were over 225 gentlemen present at the clinic held under the auspices of this society, this afternoon, at the depot of The S. S. White Dental Manufacturing Co. . . . Dr. H. C. Register exhibited and explained the action of his new mechanical mallet and engine. The mallet has two anti-friction rollers,—one on the periphery of the wheel, the other on the head of the plunger. The engine has two sets of idlers, which automatically adjust themselves to the strain of the pulley, keeping the tension always uniform in any position placed. It also has a separate lathe-attachment for sharpening instruments or articulating artificial teeth. Dr. Register then filled and treated a superior right cental incisor the pulp of which had been devitalized for over eighteen years. The tooth was badly discolored. After opening into the pulp chamber, the putrescent

matter was removed, and the canal thoroughly washed with permanganate of potash, used in an atomizer, and with compressed air. The tooth was successfully bleached, by a four per cent. solution of dilute sulphuric acid and Labarraque's solution, used alternately. The canal was thoroughly dried with compressed air heated to 130°, and filled with oxychloride of zinc and iodoform. The cutting edge and part of the labial and distal surfaces were then restored with Abbey's cohesive foil No. 5, folded to No. 80, packed with the mechanical mallet. Time for entire operation, one hour and forty minutes. . . Dr. R. S. Ivy made and inserted an all-gold crown on the roots of an inferior left second molar; time, about fifty-five minutes. The material used was coin gold; the masticating surface was struck in the bronze matrix recently introduced by The S. S. White Co. . . . Dr. E. C. Kirk showed the teeth implanted at the last clinic; all of them were quite firm and satisfactory to the patients. In one case there had been a slight loss of tissue by sloughing of the gum in the buccal side. This he attributed to the thinness of gum-tissue and the unusual amount of inflammation following the operation. . . . Dr. W. G. A. Bonwill showed two contour fillings, one a superior left second bicuspid, filled on the grinding and distal surfaces, and a first molar, involving the mesial, buccal, and part of the grinding surfaces. Two books of gold were used, the time consumed in operating being one hour and eighteen minutes. . . . Dr. Kimball's disk-carrier was exhibited by Dr. Kirk. While it was considered ingenious, it was open to two objections,—namely, the arrangement of the mandrel was such that the disk could be rotated in but one direction, and the slot in the special disk used caused them to break at that point.

The following paper was read by J. A. Woodward, D.D.S., of Philadelphia, upon

The Use of Matrices.

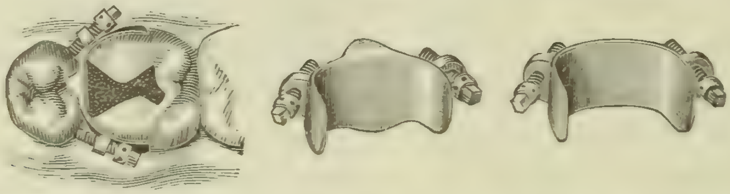
The mechanical combinations which can be made to form a matrix are numerous, particularly that of a screw with a flexible metallic band. In consequence of the difference in size and shape of the teeth and the situation and extent of the cavities, it is not possible at present to meet all these varied conditions with a single form of matrix as perfectly as with two or more forms adapted to special classes of cavities. To secure adaptability and a large range of usefulness, the matrix should be flexible and of such material, construction, and form that it will, with slight pressure, conform to the shape of the tooth. Steel, German silver, and nickel have proved the most satisfactory and durable for the flexible part or band of the matrix. The means used to retain it in position should do so

positively, and should be of such design that the pressure of the matrix against a tooth, or the closing of the band around one, can be nicely controlled, and also admit of quick adjustment or removal. To have all parts of the matrix attached is much more convenient, and often a saving of time in adjustment.

When the matrix extends from the grinding surface of the approximal tooth to just above the cervical margin of the cavity, and considerable space exists at the necks of the teeth, it should have a lug or ear at the coronal edge to prevent movement and pinching of the gum during insertion of the filling. For the class of cavities where there is but little space at the necks of the teeth, the matrix is best without the lug or ear. Its absence also enables us to use a very narrow matrix, covering a part of the cavity, near the cervical wall, or one extending to or near the point of contact of the filling.

The double-screw matrix represented in Fig. 1 combines these advantages. We are indebted to Dr. W. A. Woodward for it. Practically it is a band matrix occupying but one interdental space. The

Fig. 1.



fillings for which we have most use for a matrix are those of the approximal surfaces of the bicuspids and molars, where the teeth are usually in normal contact. For the class of cavities where the teeth are of "reasonably good structure," and have "well-defined borders," the depressed matrix will be found all that is required. This matrix allows a convexity of filling-material along the lateral and cervical margins of the cavity, which is a decided advantage in securing the correct contour of the filling and in finishing. This feature could be added with advantage to some of the other forms of matrix.

For more extensive cavities, particularly if the walls are weak, with poor structure, the field for the double-screw matrix is reached. This matrix is the equivalent of a section of a band matrix, and can be made to fit the tooth as closely. It is of German silver, has all the toughness of that metal, and is very adaptable. It can be quickly adjusted or removed. With the screws for retaining, any degree of tension can be secured between the teeth or at the cervical margin. With an increasing extent of cavity involving more of the buccal and lingual surfaces, the band matrix, occupying one interdental space, and held with a screw clamp, will be found most efficient. This matrix, being independent of the approximal tooth for

support to retain it in position, has decided advantages when there is considerable space between the teeth. The next class of cavities are those in which caries has made very extensive progress, involving the mesial, buccal, or lingual and distal surfaces, or half or the whole of the crown. For these cavities a band matrix encircling the whole of the tooth will be required.* Fig. 2 represents two forms of this matrix. An extended experience has proved their usefulness and remarkable adaptability. Within certain limits, they can be increased or reduced in size, and also present a nearly unbroken ring of metal which will conform closely to the shape of the tooth. Although the invention of the various forms of crowns has very materially reduced their field, they furnish the means for the attachment of partial or entire amalgam crowns, at a rate that would place a really serviceable and durable crown

Fig. 2.

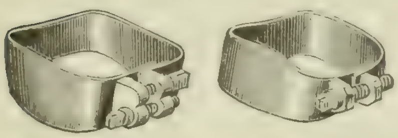


Fig. 3.

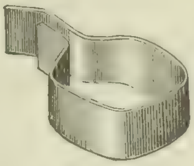


Fig. 4.

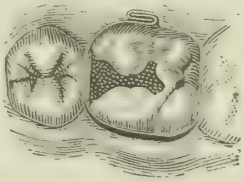
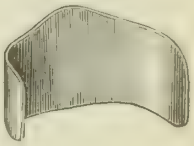


Fig. 5.



within the means of many who could not bear the expense of a more elaborate operation. The matrix, with the two screws, will grasp the remains of a crown almost level with the gum; and when secured will fairly restore the contour of the missing crown. When the buccal or labial surfaces of any tooth can be reached, to fold the ends of a thin strip of metal together, an effective band matrix can be quickly made in this manner. A strip of German silver, rolled to number 34, standard gauge, as wide as the matrix is to be, is bent around the tooth; and with a flat, sharp-edged pair of pliers is drawn tightly to it. One of these ends is left a sixteenth of an inch long; the other is cut to one-eighth of an inch in length. (Fig. 3.) The longer end is bent over the shorter one, and both are bent firmly down upon the band, making a tinman's seam. (Fig. 4.) This is sufficient to hold the matrix, and has the advantage of being easily removed.

Fig. 5 represents a form of matrix or "slide." Its use is for the insertion of large approximal amalgam fillings, or the filling of an "annex" high up in the cementum, with or without the rubber-dam. It is of steel, not tempered, and does not frequently require any means to retain it other than contact between the teeth.

When there is time, it is preferable to separate in advance until there is sufficient space to allow for the thickness of the matrix, and a clear view of the margins of the filling in finishing. When the

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*See Dental Cosmos, Vol. xxvii, page 335.

teeth have been cut away to secure permanent separations, and have closed together, they should be pressed apart, if possible, sufficiently to allow for the intended convexity of the filling also. When we cannot separate in advance, the matrices should be as thin as possible, and should rest against the approximal tooth; so that the gold or other filling-material may be driven so tightly between the floor of the cavity and the matrix that the contour of the tooth will be fully restored and contact established as soon as the matrix is withdrawn.

Where it is desirable to secure all the space possible at the necks of the teeth, the matrix should rest against the approximal tooth, and be forced away from the tooth in which the filling is inserted. This can be accomplished with the band matrices, but not so conveniently nor so positively as with the double-screw matrix. The preparation of cavities should be the same, in general, as for contour fillings, with the exception that the drilling of retaining-pits or starting-points is very rarely necessary. Should the cavity extend very near to the cementum, the thin plate of enamel should be cut away and a firm edge secured in the cementum. The cervical wall should be as straight as possible, as this reduces the risk of movement of the gold in starting the filling. When tin foil or amalgam is used, this wall may be curved to any degree. Just here is one of the most important points in favor of matrices. They so facilitate the introduction of the filling that the exacting preparation for gold when inserted without the matrix is not required. The excessive cutting away for access, especially when a mallet is to be used, can be avoided by the employment of hand-pluggers with the matrix.

The shape of the cavity should be such as to retain the filling positively, and all margins should be free of contact. Usually the preparation should be made after the rubber-dam has been applied. When the dam will not remain above the cervical margin unassisted, the preparation of this wall and all margins which will be in near contact with a matrix had best be made first; the dam and the matrix should then be adjusted and the preparation completed.

In adjusting, the cervical edge should be bent with a pair of pliers until the pressure comes upon the sound surface of the tooth above the cervical margin. This will hold the matrix free of this margin, and allow a slight overlapping of the filling. The lateral margins can also be securely overlapped as the filling progresses, the matrix being gradually forced away from the tooth by the impacted gold. This overlapping can also be nicely controlled by lessening the tension on the screws, which will allow the gold to be forced over the cavity margins. As the grinding surface is approached the pressure can be reapplied, separating the teeth at the necks and leaving only

the thickness of the matrix over the surface of the filling to be in contact. The soft or semi-cohesive gold, in blocks, mats, or cylinders, is the best to fill the first half of nearly all approximal cavities. Sufficient of one of these forms should be carefully laid along the cervical margin, and condensed in mass, on the same principle used by the old-fashioned non-cohesive gold workers. This first layer of gold should be held firmly in place by the grooves along the lateral walls. The matrix should not be depended upon to retain any part of the filling during its introduction. The remaining part of the cavity, which includes the surfaces exposed to attrition and to be in contact, should be filled with cohesive gold condensed with the aid of a mallet.

The finishing is a matter of some nicely-adapted files, emery strips, and polishing disks. If the separation has been made in advance, sufficient space can be had with a separator to finish without reducing the contour of the filling more than is desirable. If there has been no previous separation, the separator will secure the space required to finish the margins of the filling, the point of contact being burnished smooth with a very thin steel burnisher.

The face of all matrices, if polished, will reflect light in such a manner that the cavity can be more clearly seen, after the adjustment of the matrix. The slight difference in space left for access is more than compensated for by the general advantages of the matrix. Where proper access to a cavity cannot be had, the matrix should not be used. This would exclude many of the smaller approximal cavities. In practice it has been my experience that the matrix is most wanted for larger cavities with weak walls. The medium and smaller cavities with strong walls can be so easily well filled that the matrix is not an important appliance for them. When the margins of a cavity are fractured or crushed, the fault is in the matrix not being properly fitted, or in the employment of too much force.

Matrices have won a place among the permanent appliances of the contour system. When used with discrimination, we have a short cut to results fully equal to those accomplished by more laborious methods. They enable us to employ soft or semi-cohesive gold positively. For the insertion of tin or amalgam, particularly along cervical walls, the superior adaptation and condensation of these materials is most decided.

[After reading his paper, Dr. Woodward exhibited the matrices in position on plaster models; also a set of plug-finishers.]

Discussion.

Dr. Bennett. I regard the matrix as an appliance that has positive merits, which are evident enough when it is used under proper

conditions. It saves time and labor, and certainly simplifies what is otherwise a complicated operation. The matrix is not a new appliance, having been used by a few operators for some years; but it is now coming into general use. It is still condemned by many, who claim that it hinders rather than helps the insertion of a perfect filling, the result always being defective margins.

The matrix is a most valuable factor in solving the problem of operative dentistry,—viz., the management of the approximal surfaces. As we all know, about ninety per cent. of all cavities are between the teeth; the most difficult are those in the bicuspids and molars, and it is to these that the matrix is specially adapted; and I think it the best appliance yet devised for simplifying the filling of all distal cavities in these teeth.

An approximal cavity can be truly called a half-cavity; all the trouble in filling it coming from the absence of the wall, which the matrix supplies more or less perfectly. A difficult approximal cavity is thus transformed into a crown cavity, which is the ideal of simplicity and certainty in filling. The point of difficulty, and the only point of difficulty, is found in the angle formed by the matrix with the buccal and palatal or lingual walls of the cavity. This angle is made all the more acute, since all enamel borders should be beveled. Now, if a matrix was as unyielding as a cast-iron band, I would have but little use for it; but most matrices as now made are flexible, and yield a little to the impact of the plugger; and the gold is thus forced beyond the tooth-wall, the slight excess being afterwards trimmed away.

One source of failure in fillings in general, and of this class in particular, is found in the injury done to the enamel by the straight sides and sharp edges and corners of pluggers. Several years ago I made a set of plugger-points based on a study of standard sets, and made a series of experiments, the result of which was a set of points that are at once "gold adapters" and "gold builders," well suited to all purposes except perhaps matrix filling. I always get the best results when the smaller points are convex and cut one way, and when the longer foot pluggers have no edges or angles, and have two working surfaces. I did not succeed in making any improvement in matrix pluggers, except slightly to round off the edges or corners of those long in use for this purpose. I would not have anyone infer that I think the matrix the thing for all classes of approximal fillings. Many who find an appliance good for one class of cases are too much inclined to jump at the conclusion that it is the best thing in all cases; thus bringing many a good thing into disrepute by their lack of discrimination. This sums up the history of many appliances.

Dr. Guilford. I was just remarking to my neighbor that I had said so much and spoken so often upon the subject of matrices that I did not know that I could say anything new to-night. Like many others, years ago I began to feel the need of some appliance that would lessen the labor and difficulties attending the filling of large compound approximal cavities. A piece of broken file first answered the purpose; then came wood and bent pieces of steel; after that came the Jack matrix, and to-day we have the appliance in all varieties of form.

My opinion of matrices can be summed up in a few words. It is that the operator who has not learned to use them, or does not feel the need of them, has deprived himself of one of the greatest aids in filling teeth. The saving of time and fatigue to both patient and operator should certainly commend them to every practitioner. I bless this little appliance for the labor it has saved me, and the nervous strain it has saved my patients.

Those who do not favor the matrix urge three principal objections to its use. They claim that the time required for its proper adaptation and adjustment for any case in hand is not compensated for by the saving of time in filling. To this I would say that, with a little experience, a suitable matrix can be fitted and adjusted in a few minutes' time; while the time saved by its use in a cavity of any considerable size will easily range from half an hour to an hour. This is so because by its use we introduce only the amount of gold we need, plus a little surplus for finishing; while the time saved in finishing is considerable, not to mention the discomfort saved the patient by lessening the time and pain usually attending this part of the operation. Again, it is claimed that in using the matrix you lessen the space in which to operate, and hence must go more slowly. True, it does limit one's space somewhat, but not any more than it ought to, when we want to avoid introducing a great excess of gold. This lessening of operating room will not much delay the introduction of the gold with one who is used to it; while the feature of having a compound cavity reduced to a simple one enables us to work with greater rapidity, by lessening the difficulties of the operator.

The third objection put forth is that, by the use of a close-fitting matrix, there is great danger of the gold not making a perfect joint at the margins. In close-fitting and perfectly rigid matrices this objection would be a valid one; but by using those that are made of a band of flexible steel, partially encircling the tooth, and held by a suitable clamp, no difficulty of this kind will be met with, provided the operator exercises reasonable care and skill. All flexible steel bands will yield a little under the impacting force of a mallet upon

the gold, no matter how tightly they may have been adjusted in the beginning; and this slight yielding will afford a little space at the margins, permitting perfect adaptation and a moderate amount of surplus for finishing.

After the tooth is filled and the matrix removed, we have a contour filling that has not taken any special skill to produce; while to obtain the same result without it would demand the highest order of artistic skill, which few possess.

The finishing of the filling on the approximal surface is easily accomplished, as the filling is already shaped, and only needs the removal of the slight surplus at the cervical and lateral margins, and the usual smoothing and polishing.

Dr. James Truman. I have never been able to enter enthusiastically into the subject of matrices, as I have had but little success with them. This is probably my fault; but their use, it seems to me, must be confined to exceptional cases. The fact that so many good operators employ them with satisfaction leads me to hesitate to express this much in opposition.

There are some objections that have been alluded to which are to my mind serious. Dr. Guilford mentioned the fact that there was some difficulty with cervical borders on distal surfaces. Another, I would suggest, is that the cavity is so closed up that a thorough observation of it as the operation proceeds seems to be an impossibility. If non-cohesive or semi-cohesive gold be used at the cervical surface of the cavity, there will be a tendency to a drawing in of the gold, and when the packing is completed and the matrix is removed I would expect to find a defective edge. This was a difficulty always experienced with non-cohesive foil; and Dr. Elisha Townsend recommended the folding of the gold into a plate, and allowing this to extend beyond the wall. His idea was that, by the time the filling was completed, this would be drawn in flush with the edge. I think all who enjoyed his instructions made use of this plan with satisfaction. That matrices can be employed with benefit in packing amalgam and in contouring it, I have no doubt; but from my present experience I can but regard their use with gold as exceedingly limited. The main idea is, I think, to secure contour readily on distal surfaces. Now, while I have no wish to change the current of thought in this discussion, I do wish to say that I do not regard contouring as so very essential. Much has been said and written pro and con on this subject, and it will remain a source of contention. Contouring had its place before Dr. Marshall Webb so earnestly advocated it, and it will always have a certain value, but it is not always the best practice, in my opinion.

Dr. Guilford. Dr. Truman has spoken of the difficulty of filling

the cervical margin of the cavity with the matrix in position. There should be no difficulty about this, if the operator exercises care and uses gold that is pliable and soft in its working qualities. I employ gold that is in such condition that it will stay where I put it, and is readily adapted to the part.

Dr. Truman. What do you mean when you say soft?

Dr. Guilford. When I say soft, I mean soft,—that is to say, gold that is pliable, and not that which is stiff, or harsh, or crisp. All pure gold is soft, unless its condition has been changed by rolling, hammering, or overheating. The over-annealing of gold foil greatly injures its working qualities, and has been the cause of numberless failures in filling teeth. I use foil or soft cylinders that are in a semi-cohesive state,—work very much like non-cohesive gold; they are free from harshness, and only slightly cohesive under pressure. Near the surface, where I want more cohesion, I warm the gold slightly, and it gives me just the result I desire. In filling the cervical portion of a compound cavity with the matrix in position, I sometimes start the filling from a starting-pit judiciously placed; but if the cavity be not too wide, I prefer to start with a loosely-rolled cylinder or two, a little longer than a horizontal depth of the cavity; placing them with one end toward the center of the tooth, and the other against the matrix. After matting them well to place by hand, I condense them with the mallet. After getting a good foundation in this way, and making sure of my cervical border, I usually continue and complete the filling by the mallet alone; using either foil or loose cylinders, or both, as may seem best.

Dr. Bonwill. With what per cent. of cavities do you use the matrix?

Dr. Guilford. I use it with all compound distal approximal cavities in bicuspids and molars. If I put the matrix on the distal surface, I get the reflection into the cavity; but it renders no assistance on the mesial surface.

Dr. Bonwill. If you had an anterior and distal cavity together, which would you fill first.

Dr. Guilford. The distal first.

Dr. Bonwill. Can you convey the gold as far over the margin of the cavity with a matrix as without?

Dr. Guilford. Yes, farther; I can carry it half way round the tooth if I desire to.

Dr. Kingsbury. I wish to congratulate the essayist on his interesting and valuable paper, and also on the ingenious and admirably constructed appliances he has presented for examination. I think I express the sentiments of those present when I state that Dr. Woodward's set of matrices seems to be the most complete and val-

uable that I have yet seen for the purpose intended. There is no disputing the fact that occasionally we do meet with cases in our practice where a properly constructed and easily adaptable matrix will prove a valuable auxiliary, especially in filling molars the crowns of which are so badly decayed and broken that only a small part is left. For many years I have used thin steel, silver, and tin for this purpose. I have perhaps in my practice employed them more frequently and satisfactorily in restoring the lost crowns of molars and sometimes bicuspids with gold alloy or amalgam.

I have occasionally employed matrices of my own construction for filling large approximal cavities in the molars with gold. But I confess that I am not as partial to them, or as dependent upon them, in the case of large contour gold fillings as many others seem to be. In many cases I think the use of the matrix lessens the space between the teeth to an extent that renders the operation more difficult, and the impacting of the gold less perfect at the cervical wall of the cavity, than when the operator has the advantage of all the space between the teeth. In many cases, where other operators would regard the matrix as almost if not quite indispensable in filling large compound cavities with gold, I have, by first pressing the teeth well apart, and then using a properly-shaped wedge between the teeth,—so adjusted as not to cover any part of the cavity to be filled,—been able to impact the gold with greater facility and solidity at the cervical wall and other difficult points; and have obtained in this way more satisfactory results, and in much less time, than by using a matrix such as I have improvised for special cases. One objection to the use of matrices has been the time required in many cases for their adjustment; but the construction of some of those exhibited this evening may in a measure obviate this objection.

In filling large approximal cavities in teeth where the cervical portion of the tooth is involved, as it usually is, it will readily be seen, I think, that every part of the cavity as well as every portion of gold introduced must be perfectly under the control of the operator, and subject to the direct action of the point of the instrument used for condensing the gold; and the line of force must be at various angles with the long axis of the tooth, as well as in a direct line with it. Any form of matrix that will in any way interfere with these conditions and methods of operating would be objectionable. Again, in the insertion of most gold fillings, a slight redundancy of gold is desirable,—I may perhaps say quite essential,—so as to admit of filing, condensing, burnishing, and its final contouring and completion, that it may prove a skillful work of art, at once useful, beautiful, and durable. With the matrix, can this excess of gold in all cases be secured?

Much practice, perseverance, and patience will in certain cases be needed in the successful use of the matrix, as well as in other departments of operative dentistry. That the various forms of matrices in use in the past have not met the expectations of their inventors and advocates in all cases, we have abundant facts and failures to prove. I have recently been operating for a patient in whose mouth I found a large number of gold fillings in the approximal surfaces of the bicuspids and molars,—superior and inferior. These fillings were inserted by a gentleman of high professional standing in our city, and I was told by the patient that in many of the operations he used the matrix. I found that several of these fillings had failed at the cervical portion of the tooth, while they were apparently intact in that part corresponding to a half or third of the crown nearest the grinding surfaces of the teeth. Many of these teeth had to be refilled, inasmuch as there was extensive caries above the fillings in the upper and below the fillings in the under teeth. I gave these cases the benefit of a thorough and impartial examination and judgment. I knew the operator to be a good one, and he was a strong advocate of the dental matrix. My candid conclusion in this case was that the matrices used contributed to the defects and failures of many large fillings. Yet I do not claim that my opinion is infallible. They might have failed had they been filled with care and skill without the aid of the matrix; for we know that in some teeth the very best operations fail to prevent the recurrence of caries. Such cases, however, are fortunately exceptions to the general rule.

Dr. F. M. Dixon. Those who operate most successfully, and produce the most satisfactory results, work by rule, and love that rule. I am familiar with the operations of Dr. Woodward, Prof. Guilford, and others, who employ the matrix habitually, with the very best results. I have made but little use of it myself, but I believe that for those who practice with it there can be no question of its availability. I think it would be a good plan to make starting-pits, and begin the filling before applying the matrix. It would be well to have a starting-pit on each side of the cervical margin of the cavity, and fasten into each a good foundation; then apply the matrix. By this means adequate security against possible accidents of the character alluded to could be obtained. The failure of teeth filled by the aid of the matrix was spoken of by Dr. Kingsbury; but we are all familiar with the characteristics of some teeth, which are bound to decay over and again, though filled in the most perfect manner possible. When, therefore, we meet with such cases, it is not fair to attribute the recurrence of decay either to the use of the matrix or to any other mode of filling.

Dr. Tees. The danger of relying too much on the artificial wall

formed by the matrix is referred to by the essayist. The material used—even amalgam—should be first well pressed or malleted against the remaining natural walls of the cavity, so that it can be kept in position independent of the matrix. I have had amalgam fillings become dislodged—where the matrix was used—because I placed too much dependence on this artificial wall. Such cavities as are represented in Fig. 1 have been filled with soft foil to last for years, without the use of the matrix. When it is used it would be better to form a compound cavity, by drilling into the masticating surface, as shown in Fig. 1. I would commence the filling by securing an anchorage in this crown cavity, and working towards the cervical border. In this way a solid, permanent filling can be much better secured.

Dr. Bennett. I would advise anyone who has not used the matrix to take a number of freshly-extracted teeth, set them in a plaster model of the jaw, with the matrix in position, and fill the cavities carefully with tin foil; and after finishing remove the teeth and examine the work critically and see by this means just what can be done. Though the subjects of preparing cavities and packing gold are well-nigh threadbare, I will at least allude to the former. As I said, it is the *side walls* that are hard to adapt the gold to perfectly. The cervical is the easiest of all to fill, provided it is prepared properly. I simply cut this wall plain and smooth with a chisel excavator, having a short blade, at an angle of 45°, and a square edge; then bevel the edge very little, and drill a shallow starting-point at each angle. I do not groove this wall unless the tooth is thick at the neck. When these pits are filled I carefully apply the matrix, and crowding in a large mat of semi-cohesive gold, I make a base for the filling, which can be packed with as large a point as there is room for; using a small one around the border and in the angle already mentioned.

The subject of matrices is one to which I have given some time and thought, and in my opinion the matrix is an appliance which, like the separator, has come to stay. These two appliances I consider very valuable in the management of the approximal surfaces; and they are both, doubtless, essential in realizing that ideal of dental art, the contour filling. But I must add at once that, though I consider contour fillings the true ideal, this mode of operating must be modified to conform to the conditions of teeth and cavities.

Dr. J. A. Woodward. The general practice should be to restore the contour of the approximal fillings of the bicuspids and molars, with few exceptions. The contour filling can be easily repaired. When it must be renewed, the space at the necks of the teeth will be found intact, and the gum to have been protected. If ordinary skill and care are exercised in the preparation of the cavity and adjust-

ment of the matrix, with the improved forms of gold and instruments, the fault cannot be in the appliance if perfect cervical margins are not secured. Gold fillings inserted with the aid of matrices are, *at least*, as durable as those inserted by any other method; and for combination fillings the results obtained are decidedly the best. The loss of space for access is of no consequence where the matrix is most needed, and is more than compensated for by the general advantages. Sufficient space can always be had if the matrix is correctly adapted.

With separators, pressure can be gradually applied to separate teeth with the least amount of pain, and without touching the gum. The wedge, when above the point of contact, is certainly inferior as a means of separating.

Dr. James Truman. Before the debate is closed I wish to correct a seeming impression that I am opposed to the use of matrices. This would be very far from the truth. It is important, however, to have the objections considered, and answered, if possible, to the satisfaction of doubting minds. I have but little faith in the salvation of the cervical border under all circumstances; and it is no reflection on an operator's ability that his fillings fail there. The case described by Dr. Kingsbury may come under this head. When we remember the conditions nearly always present at this border, it is surprising that any operations remain unaffected.

Dr. Dixon. As the subject of separating has been alluded to, I would ask if any of those present have been in the habit of using linen tape for the purpose; and whether there is any particular kind that is considered best? I have used it to a limited extent, but have recently seen a broad separation made in this manner, without producing the slightest pain, for one of my patients. It was kindly done for me by Dr. Shepard, of Boston. Upon removing it, I thought the material seemed to be different from anything I had seen used, but unfortunately dropped it in the cuspidor without examining it as carefully as I should have done.

Dr. E. H. Neall. I have used it for many years with a great deal of satisfaction. It is the ordinary cotton braid, and I find that I am able to make separations with it with very little discomfort to the patient. The tape is drawn through the teeth, and cut close with a pair of scissors. As space is gained, two, three, or four thicknesses are applied, according to the amount of space needed. One great advantage is that the patient can apply it as readily as the dentist.

Dr. James Truman expressed the pleasure he had derived from the paper and the illustrations, and moved a vote of thanks to the essayist, Dr. Woodward. This was passed unanimously.

Ambler Tees, D.D.S., *Recording Secretary.*

MARYLAND STATE DENTAL ASSOCIATION.

The fifth annual meeting of the Maryland State Dental Association was held in the infirmary of the Dental Department of the University of Maryland, Baltimore, February 16, 1888.

The following officers were elected for the ensuing year: Wm. A. Mills, president; A. C. McCurdy, first vice-president; M. Gish Sykes, second vice-president; Charles F. Dinger, recording secretary; Charles H. Harris, corresponding secretary; Thomas H. Davy, treasurer; William H. Hoopes, Richard Grady, and John C. Uhler, executive committee.

Charles H. Harris, *Corresponding Secretary.*

MARYLAND STATE ODONTOLOGICAL SOCIETY.

A meeting of the dentists of the State of Maryland was held in Johns Hopkins Hall, Baltimore, on the evening of October 27, 1887, for the purpose of organizing a State society, and resulted in the formation of the Maryland State Odontological Society.

The following officers were elected to serve for the ensuing year: Edward Nelson, president; A. Price, Grafton Monroe, and E. S. Dashiell, vice-presidents; Wm. A. Montell, recording secretary; F. F. Drew, corresponding secretary; T. S. Waters, treasurer; S. C. Penington, librarian; E. P. Keech, J. J. Williams, and B. Meyer, executive committee.

F. F. Drew, D.D.S., *Corresponding Secretary,*
No. 701 N. Howard St., Baltimore, Md.

IOWA STATE DENTAL SOCIETY.

The twenty-sixth annual meeting of the Iowa State Dental Society will be held in Iowa City, commencing Tuesday, May 1, 1888, the sessions to continue for four days.

Dr. G. V. Black and others from neighboring States will be present and have a place on the programme, which will be an unusually interesting one.

The following are the officers for 1887-8: W. P. Dickinson, president; A. O. Hunt, vice-president; J. B. Monfort, secretary; and J. S. Kulp, treasurer.

J. B. Monfort, D.D.S., *Secretary*, Fairfield, Iowa.

LAKE ERIE DENTAL ASSOCIATION.

The twenty-fifth annual meeting (or quarter-century) of the Lake Erie Dental Association will be held in Meadville, Pa., beginning on

the first Tuesday in May (1st), 1888, the sessions to be continued for four days.

Clinics will be held during the meeting. It is the intention of the executive committee to make this the most interesting and instructive dental meeting that was ever held in Western Pennsylvania. Members of the profession are cordially invited to be present.

C. D. Elliott, *Secretary*, Franklin, Pa.

NEBRASKA STATE DENTAL SOCIETY.

The annual meeting of the Nebraska State Dental Society will be held at Grand Island, Neb., May 15, 1888.

The following are the officers for 1887-8: H. T. King, president; H. C. Miller, vice-president; W. H. Stryker, treasurer; I. W. Funck, secretary; W. W. Vance, corresponding secretary.

An invitation is extended to dentists in and out of the State to be present and make our meeting a success.

I. W. Funck, *Secretary*, Beatrice, Neb.

ILLINOIS STATE BOARD OF DENTAL EXAMINERS.

A meeting of the Illinois State Board of Dental Examiners will convene at the St. Charles Hotel, Cairo, Ill., on Monday, the 14th of May, 1888, at 11 o'clock A.M. The sessions will continue for three days.

All parties desiring to obtain license to practice in this State, or having other business that requires the action of the Board, will please govern themselves accordingly.

Charles R. E. Koch, *Secretary*,
No. 3011 Indiana avenue, Chicago, Ill.

KANSAS STATE DENTAL ASSOCIATION.

The Kansas State Dental Association will hold its annual meeting at Topeka, Kan., on the last Tuesday in April (24th), 1888.

C. B. Gunn, *Secretary*, Leavenworth, Kansas.

FIFTH DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The Fifth District Dental Society of the State of New York will hold its twentieth annual meeting at the Butterfield House, Utica, N. Y., on Tuesday and Wednesday, April 10 and 11, 1888.

Members of the profession from other societies are cordially invited to be present and take part in the discussions.

C. J. Peters, *Recording Secretary*, Syracuse, N. Y.

TEXAS DENTAL ASSOCIATION.

The next meeting of the Texas Dental Association will be held in Dallas, Texas, commencing on the first Tuesday in May, the sessions continuing for four days.

T. H. Lipscomb, D.D.S., *Cor. Sec.*, Waco, Texas.

DENTAL COLLEGE COMMENCEMENTS.

BALTIMORE COLLEGE OF DENTAL SURGERY.

The forty-eighth annual commencement of the Baltimore College of Dental Surgery was held at the Lyceum Theater, Baltimore, Md., on Thursday, March 8, 1888.

The annual oration was delivered by Dr. W. H. Dwinelle, and the valedictory by W. W. Dunbracco, D.D.S.

The number of matriculates was one hundred and fourteen.

The degree of D.D.S. was conferred upon the following graduates by Professor R. B. Winder, dean of the faculty:

NAME.	STATE OR COUNTRY.	NAME.	STATE OR COUNTRY.
D. S. Arnold	Alabama.	A. Mills	Canada.
R. Blackwell	Virginia.	R. H. Moloney	Canada.
R. H. Blair	Texas.	W. P. Moore	Virginia.
F. V. Brooking	Illinois.	C. G. Myers	Indiana.
C. C. Buck	Maryland.	H. Muller	Germany.
W. E. Bunn	Georgia.	J. M. Parker	N. Carolina.
W. D. Cowan	Canada.	G. W. Patten	Minnesota.
J. H. Crossland	Alabama.	W. H. Phillips	New York.
J. C. Dana	New York.	J. Rust	Virginia.
M. L. Dawson	Virginia.	W. H. Savage	N. Carolina.
W. W. Dunbracco	Maryland.	J. W. Semones	Virginia.
J. W. Fisher	Virginia.	A. W. Seidler	Maryland.
J. D. Ford, Jr	Maryland.	J. W. Smith	Virginia.
W. S. Gregory	Virginia.	M. A. Sparks	Alabama
S. W. Gregory	N. Carolina.	G. J. Sproul	Canada.
C. F. Harding	New York.	R. H. Stephenson	Virginia.
G. E. Hardy	Virginia.	S. Szuwalski	Maryland.
C. W. F. Holbrook	New Jersey.	H. W Talley	Virginia.
W. F. Holt	Georgia.	W. J Thurmond	Georgia.
T. H. Kellam	Virginia.	J. B. Walton	D. Columbia.
A. E. Kellogg	Pennsylvania.	J. E. Ward	Pennsylvania.
E. C. Kirby	Maryland.	F. A. Warnes	Connecticut.
W. R. Knight, Jr	New York.	W. D. Williams	Virginia.
L. P. Leonard	Dakota.	L. W. Wilson	Virginia.
A. C. Liverman	N. Carolina.	J. T. Wright, Jr	Virginia.
B. F. Mardis	Pennsylvania.	R. E. Wilkinson	New York.
C. H. McLean	Illinois.		

PHILADELPHIA DENTAL COLLEGE.

The twenty-fifth annual commencement of the Philadelphia Dental College was held at the Academy of Music, Philadelphia, on Friday evening, February 24, 1888.

The address to the graduates was delivered by Professor Henry I. Dorr, M.D., D.D.S., and the valedictory by Lewis A. Obrian, D.D.S.

The number of matriculates was two hundred and fifteen.

The degree of D.D.S. was conferred on the following graduates by the president of the board of trustees:

NAME.	STATE OR COUNTRY.
Edgar D. Albee	Massachusetts.
D. Hurlbut Allis	Massachusetts.
Chas. E. Anderson	New York.
Graham A. Andrews	New York.
David G. Atwood	New Jersey.
G. Franklin Barden	Connecticut.
Wm. T. Beckett	Australia.
T. Edwin Bell	Canada.
Harry A. Betts	Canada.
Arthur J. Bennett	Australia.
Chas. A. Black	Pennsylvania.
Nathaniel I. Boone	Missouri.
James Brady	Pennsylvania.
H. E. Belden	Louisiana.
John B. Brown	Illinois.
G. M. Brunson, M.D.	Michigan.
Sylvester W. Clark	Rhode Island.
Alonzo A. Cook	New York.
John A. Craig	Canada.
Elizabeth A. Davis	Pennsylvania.
Frank I. Diamond	Pennsylvania.
G. Wheaton Dixon	Massachusetts.
Edward Dunn	Italy.
Hobart E. Duncan	Iowa.
L. V. W. Dupuis	Canada.
John R. Fowser	Illinois.
James K. Frain	Canada.
Joel R. Fritz	Nova Scotia.
F. P. Gregory	Pennsylvania.
Lewis Hall	British Columbia.
Wm. C. Hamm	Ohio.
C. Olin Harrison	Pennsylvania.
Alaric W. Haskell	Maine.
T. S. Heinecken	New Jersey.
Wm. R. Hesketh	Pennsylvania.
Milton J. Hess	Pennsylvania.
Ziba Hickman	Pennsylvania.
Clarence A. Holmes	California.
Ivan Lee Hudders	Pennsylvania.
Henry L. Hunters	Illinois.
H. W. Hunsberger	Pennsylvania.
Chas. A. Jackson	Nova Scotia.
Wm. A. Jackson	Pennsylvania.
Alex. Jameson	Indiana.
Robt. Johnston	California.
T. Harry Jones	British Columbia.
F. A. Justus	Portugal.
W. B. C. Kaiser	Germany.
James A. Keene	Oregon.
Chas. Albert Keim	West Virginia.
T. Sterling Kellogg	Pennsylvania.
Geo. W. Kempter	Wisconsin.
Wm. M. Kester	New Jersey.
John S. Ketner	Pennsylvania.
F. W. Knowlton	Ohio.
Sebastian Lacavélerie	Cuba.
Marshall H. Lamoree	New York.
Frederick J. Lane	California.
Z. M. K. Langille	Nova Scotia.

NAME.	STATE OR COUNTRY.
Fred. L. Leavitt	Maine.
Luther M. Lessey	Connecticut.
John E. Liddy	New York.
Lionel S. Lodge	New York.
H. H. Longstaff	New York.
R. A. Marr	Canada.
H. D. Marcus	Austria.
A. M. Markle	Indiana.
Wm. E. Mayor	New York.
Wm. MacNeil	Scotland.
S. M. McInnis	Canada.
G. R. McKay	Nova Scotia.
A. J. McKenna	Nova Scotia.
Chas. McManus	Connecticut.
H. R. McMichael	Canada.
Ed. G. Mease	Pennsylvania.
Hannah J. Mercer	Pennsylvania.
LeRoy J. Meroney	North Carolina.
L. Early Miller	Pennsylvania.
George C. Milligan	West Virginia.
John W. Moffit	Pennsylvania.
Charles J. Monk	England.
Elmer J. Morris	Maine.
Ed. P. Mossman	Iowa.
Charles W. Muir	Nova Scotia.
Lewis A. Obrian, Jr.	Rhode Island.
Elmer A. Packard	New Jersey.
Geo. B. Payson	Pennsylvania.
E. E. Perry	Rhode Island.
Jacques Popper	Austria.
Edward E. Powers	Italy.
Alpheus Reeser	Illinois.
Harvey B. Reinohl	Pennsylvania.
Jethro G. Roberts	Canada.
C. Fred. Rogers	Ohio.
Wm. J. Rogers	Ohio.
Wm. M. Rosenthal	Pennsylvania.
R. R. Schættle	Wisconsin.
Chas. R. Scholl	Pennsylvania.
H. R. Scott	Virginia.
De Witt C. Shaw	Massachusetts.
Samuel C. Slade	Connecticut.
Geo. A. Sloane	Pennsylvania.
A. B. Stephens	Pennsylvania.
Olin W. Stoughton	Vermont.
Robert W. Stuart	Canada.
Chas. Sweeney	New York.
Clarence G. Taylor	Illinois.
Geo. E. Thompson	Canada.
Elmer C. Todd	Indiana.
Chas. L. Topliff	Iowa.
Edwardo Urueto, Jr.	Mexico.
Hall T. Varrell	New Hampshire.
Allen W. Wark	Illinois.
Eugene R. Warner	Illinois.
Alfred H. Waters	Pennsylvania.
E. E. Weagant	Canada.
F. L. Wood	Maine.
F. F. C. Woodward	New Jersey.

OHIO COLLEGE OF DENTAL SURGERY.

The forty-second annual commencement of the Ohio College of Dental Surgery was held at College Hall, Cincinnati, Ohio, on Wednesday, March 7, 1888, at 8 o'clock P.M.

The annual address was delivered by Rev. Dudley W. Rhodes, and the class oration by A. B. Fletcher, D.D.S.

The number of matriculates for the session was one hundred and twenty-one.

The degree of D.D.S. was conferred on the following graduates by George W. Keely, D.D.S., president of the board of trustees:

NAME.	STATE.
D. S. Anderson	Ohio.
H. J. Bosart	Ohio.
E. D. Broadwell	Ohio.
H. W. Cleland	Ohio.
D. M. Clement	Ohio.
J. W. Cartmell	Kentucky.
C. B. Clark	Kentucky.
Mrs Jessie Dillon	Ohio.
M. H. Evans	Ohio.
A. B. Fletcher	Ohio.
R. B. Foster	Minnesota.
W. E. Gochenour	Wisconsin.
H. E. Harlan	Ohio.
F. Y. Herbert	Ohio.
J. W. Hillman	Ohio.
E. D. Hinkley	Ohio.
C. B. Hussey	Ohio.
I. F. Hussey	Ohio.
N. B. Hartwell	Indiana.
O. T. Hanson	Illinois.
J. A. Henning	Missouri.
J. F. Hardman	Iowa.
C. G. Lockwood	Ohio.
M. A. Menges	Indiana.
O. S. Mills	Illinois.
H. H. Robinson	Ohio.
B. C. Reid	Indiana.
J. F. Rees	Kentucky.
A. H. Rainey	Illinois.
R. D. Rood	Wisconsin.
C. A. Schuchardt	Ohio.
J. B. Schunck	Ohio.
H. T. Smith	Ohio.
Mrs. Z. V. Swift	Ohio.
T. D. St. John	Ohio.
W. C. Shankland	Kentucky.
B. L. Shobe	Kansas.
W. E. Scott	Missouri
T. H. Sexton	Pennsylvania.
J. P. Tudor	Ohio.
R. H. Updegraff	Kansas.
S. M. Ulrey	Ohio.
Edwin Waddel	Ohio.
W. W. Wallace	Ohio.
E. J. Ward	Indiana.
W. A. Windell	Canada.

MISSOURI DENTAL COLLEGE.

The twenty-second annual commencement of the Missouri Dental College was held, in connection with that of the St. Louis Medical College, at Memorial Hall, St. Louis, Mo., on Thursday, March 8, 1888.

Addresses were delivered by Drs. J. S. B. Alleyne, Henry Fisher, and Henry H. Mudd, and the valedictory address by Prof. John Green.

The number of matriculates for the session was thirty-five.

The degree of D.D.S. was conferred on the following graduates of the dental class, by Professor H. H. Mudd, M.D., dean:

NAME.	STATE.
William S. Cady	Kansas.
John A. Fries	Missouri.
Jesse E. Grosheider	Indiana.
John H. Kennerly	Missouri.
Robert E. Kiernan, Jr	Missouri.
Clarence W. Knox	Missouri.
H. Muetze, Ph.G	Missouri.
John G. Northington	Kansas.
Murray W. Phillips	Missouri.
Willard A. Roddy	Missouri.
Montana T. Smith	Missouri.
Hugo E. Wangelin	Illinois.
Charles H. Williams	Missouri.

PENNSYLVANIA COLLEGE OF DENTAL SURGERY.

The thirty-second annual commencement of the Pennsylvania College of Dental Surgery was held at the Academy of Music, Philadelphia, on Thursday evening, March 1, 1888.

The valedictory address was delivered by A. E. Hall, D.D.S., and the address to the graduates by Prof. Henry Leffmann, M.D., D.D.S.

The number of matriculates for the session was one hundred and sixty.

The degree of D.D.S. was conferred on the following graduates by S. W. Gross, M.D., LL.D., president of the board of trustees:

NAME.	STATE OR COUNTRY.
John C. Apeldorn	Pennsylvania.
Mortimer J. Barrett	Pennsylvania.
John C. Bates	Minnesota.
Ansel P. Calvert	Missouri.
Wilhelmina Carsten	Germany.
Enos E. Clark	Kingston, Jamaica.
A. C. Cope	Pennsylvania.
C. B. Cragin	Minnesota.
E. M. Cundall	Pennsylvania.
Geo. H. Cutler	New York.
Elbert T. Davis	New Jersey.
Geo. H. Dungan	Pennsylvania.
R. R. Dunshee	Missouri.
F. L. Ferguson	Illinois.
Byron E. Fortiner	New Jersey.
Clinton Franklin	Pennsylvania.
Samuel L. Good	Pennsylvania.
W. G. Hales	Wisconsin.
A. E. Hall	Pennsylvania.
E. J. Hausle	New York.
M. C. Harrington	New York.
A. P. Hays	Pennsylvania.
Bernard Herz	Pennsylvania.
W. B. Hills	Connecticut.
Henry C. Hinchman	Pennsylvania.
E. E. Holmes	Pennsylvania.
E. L. Housel	Pennsylvania.
F. W. Hunter	Massachusetts.
G. M. Johnston	Pennsylvania.
Emma T. Kolb	Pennsylvania.
W. P. Lamborn	Pennsylvania.
G. P. Lang	Pennsylvania.
Chas. W. Lennox	Canada.
C. D. Lowry	Pennsylvania.
J. Warren Manning	Pennsylvania.
A. A. MacConnell	Pennsylvania.
Emanuel Michaelis	Germany.
W. S. Minich	Ohio.
J. R. Moore	Pennsylvania.
W. H. Moore	Pennsylvania.
Albert E. Moritz	Germany.
B. B. Mories	Canada.
Johanna Nauhaus	Germany.
T. Adams Pratt	Pennsylvania.
Jas. W. Rowell	Minnesota.
D. B. Smith	Georgia.
Samuel E. Starr	Pennsylvania.
Mary H. Stilwell	Pennsylvania.
J. Stuart Tait	Pennsylvania.
C. L. Thourot	Pennsylvania.
E. Washburn Todd	New York.
B. Norman Tuttle	Pennsylvania.
Wilbur M. Vansant	Pennsylvania.
Geo. K. Ware	Pennsylvania.
Martha Wœbcke	Germany.
Howard H. Whitaker	Pennsylvania.
H. B. Wright	Canada.
Wm. Ziesel	Pennsylvania.

ROYAL COLLEGE OF DENTAL SURGEONS OF ONTARIO.

At the Royal College of Dental Surgeons of Ontario, Canada, for the session of 1887-8, the number of students in attendance was forty-five. After the annual examinations, the following candidates received the degree of L.D.S., March 10, 1888:

NAME.	RESIDENCE.
Fred. J. Capon	Toronto.
Geo. H. Cook	Guelph.
Donald Clark	Woodstock.
C. H. Felton	Toronto.
Jas. H. Frain	Brantford.
C. E. Green	Greenville.
Thos. G. Holt	Listowel.
A. J. McDonagh	Napanee.
Richard McKnight	Alliston.
Jesse Mills	Toronto.
J. A. Robertson	Ottawa.
J. A. Shannon	Dutton.
W. Earl Willmott	Toronto.
R. T. Winn	Waterloo.
Harold Wood	Toronto.

All of the Province of Ontario.

NEW YORK COLLEGE OF DENTISTRY.

The twenty-second annual commencement of the New York College of Dentistry was held at Chickering Hall, New York, on Saturday evening, March 10, 1888.

The valedictory address was delivered by Albert Westlake, Jr., D.D.S., and the address to the graduates by Rev. Thomas Gallaudet, D.D.

The number of matriculates for the session was two hundred and eleven.

The degree of D.D.S. was conferred on the following graduates by William T. La Roche, D.D.S., vice-president of the board of trustees:

NAME.	STATE OR COUNTRY.
Franklin P. Arango	New York.
William F. Acton	Connecticut.
Vincent W. Baker	New Jersey.
Winfield H. Baldwin	Illinois.
Charles L. Babcock	Illinois.
Virgilio Bazau	Cuba.
Jacob Bate	England.
Stephen E. Best	New York.
Herman T. Braun	Florida.
John L. Crater	New Jersey.
Francis A. Chicherio	New York.
Julian Hyde Clark	New York.
J. F. W. Clasing	Germany.
José A. A. de Castro	Cuba.
João R. da Silva	Demerara, B. G.
Wm. L. Drummond	New York.
W. B. D. Davenport	Massachusetts.
Frank M. Dunn	New York.
William S. Depew	New York.
Fred. H. Eichhorn	New Jersey.
David N. Feigensohn	Russia.
Edward Fox	Ireland.
Edward B. Griffith	Connecticut.
Walter E. Gerrish	Massachusetts.
John C. Graft	New Jersey.
Karl F. A. Haue	Germany.
Fred. M. Hayward	Vermont.
George B. Herbert	New Jersey.
Jacob Hassinger	New York.
Elias Scudder Hall	New Jersey.
William P. Ives	Connecticut.
Henry A. King	Canada.
Edward M. Kettig	Kentucky.
Dennis F. Keefe	Massachusetts.
Isaac Lyon	New York.
Charles M. Lindsey	California.
Cortez J. Mapp	Georgia.
S. T. A Müller	Germany.
Charles E. Maine	Connecticut.
Frederick L. Marshall	New York.
Nelson Merwin	New York.
Eugene W. Marshall	New York.
Vincent M. Munier	New York.
Louis P. Margron	France.
Henry John Moore	England.
John J. Merchant	Brazil.
Horace W. Northrop	Connecticut.
Frederick Nies	New York.
Albert B. Osmun	New Jersey.
William H. Pruden	New Jersey.
Charles A. Pickhardt	Connecticut.
H. T. H. Russell	Nassau, N. P.
Edward S. Rugg	New York.
David B. Smith	New Jersey.
Arthur P. Sturridge	Jamaica, W. I.
William H. Steeves	New Brunswick.
Clarence B. Stelle	New Jersey.
Lem. Andrew Smith	New York.
John S. Sanger	New York.
Charles S. Sweedy	Illinois.
Lewis M. Slocum, Jr	New York.
Livingston A. Snyder	Pennsylvania.
Edmund L. Stevens	New York.
William J. Taylor	New York.
Willard F. Tooker	New York.
Frank van Blarcom	New Jersey.
Charles F. Weber	New York.
Ernest F. Weed	New York.
Harry P. Willcox	Connecticut.
Albert Westlake, Jr	New Jersey.
Alfred Wagner	New York.
Charles D. Wright	Canada.

VANDERBILT UNIVERSITY—DEPARTMENT OF DENTISTRY.

The ninth annual commencement of the Department of Dentistry of Vanderbilt University was held in the chapel of the university, Nashville, Tenn., on Thursday, February 23, 1888.

The class oration was delivered by J. B. Roberts, D.D.S.

The number of matriculates for the session was seventy-seven.

The degree of D.D.S. was conferred on the following graduates by Chancellor Landon C. Garland, LL.D.:

NAME.	STATE.	NAME.	STATE.
Rufus Watson Acree	Tennessee.	Wm. Thomas McKenny	Kentucky.
J. Shrewsbury Baily	Mississippi.	William Alex. Moore	Arkansas.
John Paine Broadstreet	Mississippi.	Hiram M. Moorman	Michigan.
Rufus William Carroll	Texas.	Francis Marion Parker	Alabama.
H. Evenfeld Crumbaker	Pennsylvania.	William Dyer Perkins	Alabama.
S. Glenn Duff	Texas.	J. Hamilton Perryclear	S. Carolina.
Jesse Watson Fuller	Arkansas.	Sidney Powell	Louisiana.
Norfleet Thrope Harris	Alabama.	Wesley F. Prichard	Tennessee.
Fletcher Irons	W. Virginia.	James Bennett Roberts	Missouri.
Robert Young Jones	Alabama.	T. Fields Robinson	Georgia.
John Benjamin Keefer	Pennsylvania.	Munroe J. Solenberger	Illinois.
Seaborne B. Kennedy	Georgia.	Timothy Thaxton	Alabama.
Edward David Lankford	Alabama.	Geo. Staten Vann	Alabama
Sam. Jackson Lawrence	Tennessee.	Jerry Peter Williams	Tennessee.
Frank Bettis McCaskey	Alabama.	Edward Kendal Wright	N. Carolina.
Joseph C. McCubbins	N. Carolina.	Lewis Long Yonkers	Ohio.
Mervin McFerrin	Tennessee.		

INDIANA DENTAL COLLEGE.

The ninth annual commencement of the Indiana Dental College was held in the Plymouth Church, Indianapolis, Ind., on Wednesday evening, March 7, 1888.

The address on behalf of the faculty was delivered by L. S. Henthorne, M.D., and the address to the class by Wm. H. Atkinson, M.D., D.D.S.

The number of matriculates for the session was thirty.

The degree of D.D.S. was conferred on the following graduates by W. L. Heiskell, D.D.S., president of the board of trustees:

NAME.	STATE.	NAME.	STATE.
W. A. Alexander	Illinois.	W. J. P. Lawton	Nebraska.
J. L. Barnes	Illinois.	J. W. Lopp	Indiana.
W. H. Beeson	Indiana.	C. J. Lange	Wisconsin.
C. P. Curtis	Indiana.	J. S. McCurdy	Indiana.
R. H. Clark	Massachusetts.	R. T. Oliver	Indiana.
J. H. Daugherty	Indiana.	G. W. Raber	Wisconsin.
H. S. Hicks	Indiana.	E. Reese	Ohio.
W. M. Jones	Indiana.	L. A. Stewart	Indiana.
M. de F. Kee	Ohio.		

UNIVERSITY OF IOWA—DENTAL DEPARTMENT.

The sixth annual commencement of the Dental Department of the State University of Iowa was held at the Opera House, Iowa City, Iowa, on Monday, March 5, 1888, at 8 o'clock P.M.

The annual address was delivered by Rev. Samuel N. Watson. The

degree of D.D.S. was conferred on the following graduates by the president, Charles A. Schaeffer, Ph.D.:

NAME.	STATE.	NAME.	STATE.
A. E. Anger	Iowa.	H. V. McGregor	Iowa.
J. E. Babcock	Illinois.	M. S. Overfield	Iowa.
C. P. Beyer	Iowa.	C. S. Percival	Iowa.
F. T. Breene	Iowa.	A. B. Palmer	Iowa.
C. W. Cope	Iowa.	A. L. Punton	Iowa.
E. S. Dawson	Iowa.	L. E. Roe	Nebraska.
H. D. Hinkley	Iowa.	A. L. Rist	Iowa.
O. A. King	Iowa.	J. E. Swain	Iowa.
J. A. Lovelady	Iowa.	C. H. Sippel	Iowa.
J. A. Leonard	Iowa.	C. S. Searles	Iowa.

HOWARD UNIVERSITY DENTAL COLLEGE.

The annual commencement of the Dental College of Howard University was held in the Congregational Church, Washington, D. C., March 14, 1888.

The address to the class was delivered by Prof. John E. Brackett, M.D.

The number of matriculates for the session was twenty.

The degree of D.D.S. was conferred on the following graduates by William W. Patton, D.D., LL.D., president of the board of trustees of the university:

NAME.	STATE OR COUNTRY.	NAME.	STATE OR COUNTRY.
George Geffries	Germany.	Edward F. Narcup	Vermont.
William S. Loften	Dist. of Columbia.	Walter S. Over	Dist. of Columbia.
Robert M. R. Nelson	New York.	William Richter	Germany.
Nathaniel Nesbitt	Alabama.	Frederick William Rudolph	Germany.

CENTRAL TENNESSEE COLLEGE—SCHOOL OF DENTISTRY.

The second annual commencement of the School of Dentistry of Meharry Medical Department of Central Tennessee College was held, in connection with that of the medical class, at the Grand Opera House, Nashville, Tenn., on Monday evening, February 20, 1888.

The valedictory for the School of Dentistry was delivered by Claude M. Wade, D.D.S., and the address to the dental graduates by J. P. Bailey, D.D.S.

The number of matriculates for the session was twelve.

The president of the faculty, J. Braden, D.D., conferred the degree of D.D.S. upon Henry Lewis Smith, of Texas, and Claude Melnotte Wade, of Arkansas.

This School of Dentistry was organized, in connection with the Meharry medical department of the Central Tennessee College, for the "purpose of providing the colored people of the South an opportunity to thoroughly prepare themselves for the practice of dentistry."

UNIVERSITY OF MARYLAND—DENTAL DEPARTMENT.

THE sixth annual commencement of the Department of Dental Surgery of the University of Maryland was held at the Academy of Music, Baltimore, Md., on Wednesday, March 14, 1888.

The address to the graduates was delivered by Professor Ferdinand J. S. Gorgas.

The number of matriculates for the session was one hundred and nine.

The degree of D.D.S. was conferred on the following graduates by Hon. S. Teackle Wallis, LL.D., provost of the university:

NAME.	STATE OR COUNTRY.
Benjamin F. Baer	Pennsylvania.
Robert A. Bates	Virginia.
John H. Bean	Massachusetts.
William C. Berry	Virginia.
Thomas C. Blackiston	W. Virginia.
George W. Blakeslee	New York.
Joseph H. Burgess	South Carolina.
M. O. Burkholder	Virginia.
Theodore A. Cross	W. Virginia.
Samuel S. Daniel	South Carolina.
L. Wilson Davis	Maryland.
John W. Dean	W. Virginia.
Wm. E. Dieffenderfer, M.D.	Dist. of Columbia.
Manoog D. Dinjian	Turkey.
George T. Feldmeyer	Maryland.
J. Edgar Fitzgerald	Maryland.
Julian Gartrell	Maryland.
Clarence J. Grieves	Maryland.
John M. Hamlet	Virginia.
Charles E. Harper	Virginia.
P. Edmond Hines	North Carolina.
Charles R. Holt	New York.
Charles P. Hubley	Pennsylvania.
Iræneus P. Jeter	South Carolina.
John A. Keepers	Pennsylvania.
Robert E. Lee	South Carolina.
Sylvester K. Marshall	Maryland.
A. D. McConachie	Canada
Thos. J. McLauchlin	South Carolina.
Gerhard W. Muller	Germany.
Geo. F. Nelson, M.D.	Maryland.
Frank H. Page	Canada.
Francis E. Rambo	Georgia
Stafford Rambo	Georgia.
Robert P. Rawlinson	South America.
Harry J. Ray	South Carolina.
Edgar G. Smith	New York.
Edgar L. Smith	West Virginia.
Howard M. Smith	Virginia.
James P. Smith	Virginia.
Daniel B. Snively	Pennsylvania.
Frank Ryland Steel	Virginia.
A. Zachary Taylor	North Carolina.
Frederick P. Todd	Maryland.
Joseph J. Vegas	New York.
Willis E. Watts	New York.
Jacob L. Weirich	Pennsylvania.
Fred. M. Wheeler	New Hampshire.
Robert A. Wilbur	South Carolina.
George L. Wilcox	New York.
Frank M. Willis	South Carolina.

KANSAS CITY DENTAL COLLEGE.

THE annual commencement exercises of the Kansas City Dental College were held, in connection with those of the Kansas City Medical College, at Music Hall, Kansas City, Mo., on Tuesday, March 13, 1888.

Addresses were delivered by Rev. Cameron Mann, Dr. J. M. Lane, and J. D. Patterson, D.D.S.

The number of matriculates for the session was twenty-three.

The degree of D.D.S. was conferred on the following graduates:

R. V. Anderson.
J. L. Leavel.
F. L. Murdock.
J. L. Reavis.
W. L. Reed.
H. S. Smith.
E. S. Sweet.
C. M. Tindale.

MINNESOTA HOSPITAL COLLEGE—DENTAL DEPARTMENT.

The seventh annual commencement of the Dental Department of the Minnesota Hospital College was held, in conjunction with that of the Medical Department, in the Hennepin-avenue M. E. Church, Minneapolis, Minn., on Friday, March 16, 1888.

The address to the graduates was delivered by the Rev. Dr. D. J. Burrell, and the valedictory on behalf of the class by C. D. Snow, D.D.S.

The number of matriculates for the session was thirty-eight.

The degree of D.D.S. was conferred on the following graduates by C. H. Hunter, A.M., M.D., president of the faculty:

NAME.	STATE.	NAME.	STATE.
H. G. Dampier	Minnesota.	C. L. Sargent	Wisconsin.
A. N. Cheney	Minnesota.	D. H. Carpenter	Minnesota.
C. D. Snow	Minnesota.	A. H. Benson, M.D.	Wisconsin.
H. T. Burnette	Minnesota.	J. D. Jewett	Minnesota.

EDITORIAL.

LAID OVER.

The concluding portion of our report of the Dental Section of the late International Medical Congress is in type, as are also reports of the meetings of the Louisiana State Dental Society and the Mississippi Valley Dental Association. These were to have appeared in this number, but it has been found necessary to lay them over to our next issue on account of the space required for the reports of the college commencements, etc.

BIBLIOGRAPHICAL.

Transactions of New York Odontological Society for 1887. Octavo, cloth, pp. 209. Philadelphia: The S. S. White Dental Manufacturing Co., 1888.

The papers and discussions—reprints from the Dental Cosmos—of which this volume is composed make an unusually interesting issue of the series of yearly Transactions of the New York Odontological Society. Many of the essays are illustrated, Dr. Davenport's paper on "The Dental Arches of Man" being elucidated by upwards of forty wood-cuts. Extraction, regulating, metal fillings, etc., were prominent topics during the year last past, and here receive consideration and discussion. Typography, paper, and binding are unexceptionable.

THE

DENTAL COSMOS.

VOL. XXX. PHILADELPHIA, MAY, 1888. No. 5.

ORIGINAL COMMUNICATIONS.

NATURAL ROOTS AND ARTIFICIAL CROWNS.

BY A. G. BENNETT, D.D.S., PHILADELPHIA, PA.

(Read before the Odontological Society of Pennsylvania, February 4, 1888.)

IT is not the general custom of writers on dental subjects to consider roots and crowns in the same essay; but as these are or should be closely united and inseparably connected in practice, why not in theory? The roots of the teeth are the only natural bases for dental substitutes; and as not a few consider it bad enough to be obliged to have artificial crowns, they must admit it to be much worse to have these crowns placed on artificial supports. It would be a "departure" with some little claim to newness if a general attempt were made to limit dental plates to large partial or entirely edentulous cases.

The general tendency of modern dentistry is conservative. This appears in our efforts, amid much uncertainty and not a little failure, to preserve the vitality of the teeth and to maintain the integrity of their crowns. It appears even more strikingly in our attempts to utilize the roots of the teeth for the support of artificial crowns and dental bridges. So long as teeth decay and fillings fail, crowning will be an important branch of practice; and small bridges at least can be depended on to span the chasm between crowns and plates. It may be too soon to affirm that the resources of operative dentistry are all-sufficient to save the perishable crowns of teeth; but the writer will venture the assertion that it is clearly within the capacity of dental art to stop the loss of tooth-structure at the root,—this of course not applying to those cases in which the whole tooth is lost from inherent and incurable tendencies to disease in the attachments and surroundings.

I. The Root.

Crowning can never be simply a mechanical operation, the proper preparation of the root being even more important than the perfect shaping of a deep and complicated cavity for filling. I hold the opinion that if in the course of treatment trouble arises, the operator is generally responsible; he has forced septic matter through the foramen or carried it through on the broach. As the filling respecting irritation is to the pulp, so is the crown in some respects to the membrane. Success depends largely on the safe, certain, and thorough removal and disinfection of the contents of the canal and tubuli. The canal is not strictly a cavity to be incidentally filled by crowning, nor yet a bottle to be filled with disinfectants and then corked up without risk of changes that may make its reopening imperative. It remains to be seen whether desiccation can in all cases, with or without medicating, make the immediate closing of canals under all circumstances a safe and certain procedure.

It has been truly said that when vital a tooth is alive through all its substance, and when the pulp is destroyed the dentine is dead through all its substance. Here, then, we have a mass of devitalized tissue that the principles of general surgery would require to be removed. Most of the dentine is retained because it is needed for strength. Enlarging the canal not only gives room for anchoring the crown, but a large part of the decomposing organic portion is thus eliminated. The practical man may ignore all this; but no one who thinks can fail to see that one-fourth of the dentine when decomposing must be a positive factor in disturbances of the peridental membrane.

The importance of a normal condition of the cementum, which is a highly organized and sensitive tissue, appears when it is viewed in its true relation as a barrier between the dead dentine and the living pericementum.

Recent discussions touching the filling of canals, though superficial and disappointing because so empirical, may help to curb the tendency to extremes in treating. Hot air seems to be the blast that is destined to blight the bacteria and eliminate the gases of putrefaction.

II. The Crown.

Filling and crowning are two large subjects in dentistry that must often be compared and contrasted in making up a judgment for or against the removal of tooth-structure. As all are aware, filling finds its limit in the weakness of the tooth-tissue that remains; crowning finds its limit in the frailty of the root and the extent of injury to or disease in the peridental membrane. The decaying

out of many fillings and the consequent loss of many crowns simply proves that art cannot make a success of at least the worst of nature's failure.

It is nothing but mere sentiment that would retain a last tooth in either jaw when this interferes with the retention of a denture; and nothing but sentiment that would insist on attaching a metallic tooth-section on the last third or fourth of a frail, discolored crown. It is not possible to fill all living teeth, nor is it advisable to crown all dead ones; and yet the presence or absence of the pulp makes the broadest distinction between teeth that should be filled or crowned. When any of the anterior teeth are devitalized and discolored and weakened by decay, a crown is to be preferred to a filling. The color of a yellowish tooth may be so restored as to harmonize with the gold, but the white or bluish-white teeth are in painful contrast with this material. The limit of elaborate and exhausting operations was reached about ten years ago when Webb often showed what could be done, and sometimes what should not, in this class of operations.

It would not be necessary to mention old methods of crowning were it not for the fact that some of these are still advocated in modern manuals and text-books. The first artificial crowns were attached with the so-called "pivots" of wood or metal, which often became real pivots, on which the crown turned as if to escape the impact of mastication. But the original crown was a broken-off natural one reattached by a central pin. At least one modern writer advises the same thing to be done, using amalgam as a "pivot" or anchorage. And he goes still further and advocates the restoring of entire bicuspid and even cuspid crowns with the same material. Such a structure, though faced with "white" alloy, not only does not conceal art, but loudly proclaims its entire absence. It only needs some hint of an inscription on its tablet to become a "plain black monument" erected to the memory of the departed crown. So much for the origin of the crown. I can merely hint at its evolution, and touch very lightly on some epochs in dental progress which redirected attention to the merits and claims of artificial crowns; for it is well to bear in mind, in these days of inventions and patents, that the crown and the bridge are the oldest methods of substitution. The older crowns were failures, and were soon crowded out by the dental plate, which brought in the mechanical age of dentistry. As operative dentistry progressed from stage to stage, the crown reappeared.

About twenty-five years ago or more we had a conservative revival, based on the supposed tooth-saving properties of cohesive gold foil. Too much being attempted, we had, about fifteen years

after, the late "New Departure" with the old plastics. This being also disappointing, the tooth-crown era appeared, which was marked by the invention of some new forms of crowns and by the improvement of old ones. Yet nothing seems to be new in dentistry, and it would seem that the older the idea the greater its claims to being considered new. It is surprising how often some crowns have been invented; and it is a fact that some of the most profitable patents cover ideas and devices that are well seasoned by time and well tested by experience.

It may be said, in passing, that when operative dentistry had reached the limit of restoring perishable tooth-structure, about ten years ago, there was a demand for the artificial crown which was not very promptly or perfectly supplied. Webb showed what he and the expert few could do with cohesive gold anchored within, and inclosing, the walls of frail teeth. His labors culminated in a kind of restoration which might be called filled crowns or crowned fill-

FIG. 1.

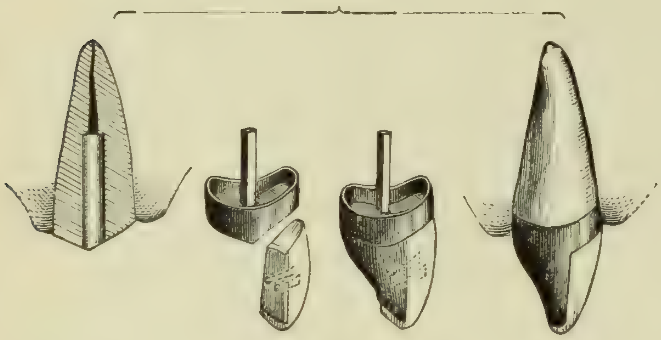
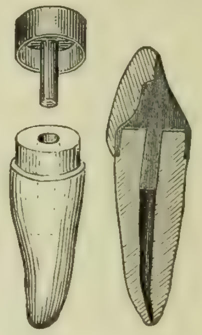


FIG. 2.



ings, being a combination of gold foil and porcelain that required many times the labor of uniting gold plate and porcelain with nothing like the durability of the latter. These elaborate and exhaustive operations culminated in an ordinary crown.

1. *The Ferrule Crown.*—I begin with this crown (see Fig. 1) because t is perhaps the best known, and has been in use as long as any not yet aid aside. It has been used and misused to about an equal extent. It is at once the most complicated and the most perfect crown yet evolved from the combination of gold plate and porcelain. Some years ago the metallic pin in the canal and base-plate on the end of the root seemed to settle the question of crowning, just as the paper shell and the needle were once supposed to settle the question of breech-loading fire-arms. It took the ferrule and the metallic shell, which is nothing but a long ferrule, to settle the question in both cases; and it may be justly doubted whether these simple and effective devices can be much improved.

There are two kinds of ferrule crowns, viz., those made and mounted by the operator and those made by machinery. The latter is the

Büttner system (see Fig. 2), which is theoretically perfect, but practically cannot be nicely adapted generally to any but the centrals. If all roots were round or nearly so, and the surface of the alveolar process flat, a ferrule made on the die and counter-die principle would be perfect. As I have given all details in previous papers as to my mode of making the ferrule crown, I will not repeat them here. As to the ferrule itself, I will only say that when properly made and adjusted it takes the place of the enamel around the neck of the tooth, and if it be nicely beveled and finely polished, the gum will not feel the absence of the one nor be disturbed by the presence of the other. I will next point out some of the uses and limitations of this kind of crown.

It may be said in general that all crowns in use have their defects, and that no crown, even when perfect, can meet all requirements in different cases. Though many seem ready to exclaim as each new crown appears, "Here it is at last," we still wait for the universal self-adjusting and indestructible crown. Dr. Dexter truly says that any one system of crowning applied to all cases will soon form a record of failures.

The ferrule and the "collar" crown, of which I will speak again, have the widest range of usefulness. As single teeth they are the strongest and give the best protection to the root, and are the only ones adapted to bridging. These and all similar crowns have at least two defects: the porcelain facing with a metallic backing cannot have a natural color or vital appearance; and it is liable to be checked or fractured. Unless these facings have been actually checked they have ample strength to resist even an unusual strain. This point I have tested by a number of experiments which show the remarkable hold the two small pins have in plate teeth. The metallic backing is not so objectionable in bridge-work, as where there are several continuous crowns the color is not contrasted with the natural teeth. It is in single crowns which stand next to vital and translucent teeth that the color of the plate tooth shows to the worst advantage. It is evident that the all-porcelain crown must be substituted sooner or later for the plate-tooth in such cases, in order to secure the very desirable natural color and vital appearance.

2. *The Collar Crown.*—Several years ago I used this crown (see Fig. 3, collar at F) almost exclusively on the front teeth. Then for a while I used the ferrule crown on account of its entirely closed cap and its utility in bridging. Of late I have returned to the collar crown, which I now make a little differently from what I did formerly. I make the collar a little wider and heavier, and extend it a little farther around the root; besides this I make the pin a little

thicker, and flatten its sides, in order to counteract the tendency to turning, especially when the central root also supports the lateral. Making the collar wider requires that the enamel be scaled from the sides of the root, as well as a slight trimming on its palatal surface. When prepared in this way the root is somewhat flattened laterally, which effectually prevents turning of the crown. Made as I have described, the "collar" crown forms an excellent pier or abutment for bridging.

One reason why I prefer this crown is that it can be made more quickly than the ferrule. When the palatal extension of the base-plate is so cut and bent as to inclose the collar, these can be united with wax and resin cement, placed in position, the pin inserted and the facing ground and backed; all the parts, being now assembled, are waxed together as before, and invested,—all the soldering being

Fig. 3.

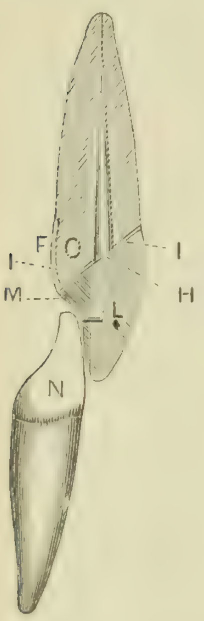


Fig. 4.

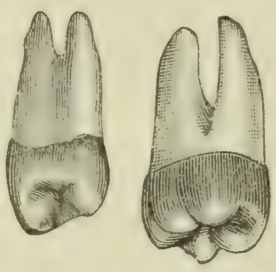


Fig. 5.

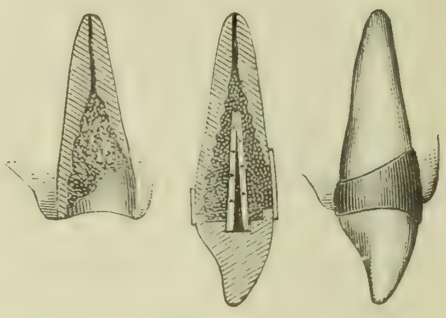
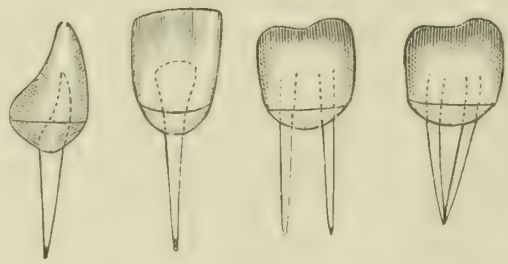


Fig. 6.



done at one "heat." It will be seen that this saves time and enables the operator to make the crown at one short sitting. This crown is anchored with gutta-percha. The mode of applying this material will be described later.

3. *Cap-Crowns.*—The well-known cap or all-gold crown (see Fig. 4), which is the real Richmond crown, is often applied and not unfrequently misapplied. It is often difficult to adjust to whole or nearly whole teeth, because nature does not make even the worst kind of a tooth so imperfect that a collar which fits its neck can be passed over its crown. And a collar, no matter how finely fashioned, that does not fit the neck of a tooth, will soon have no neck to encircle. Yet this is a most valuable crown, when it is nicely adjusted, for second bicuspids and molars; and it can scarcely be dispensed with in bridge-work. In adjusting it the main points are these: it must fit

the neck of the tooth closely or be kept entirely away from the gum. Such a crown extending half-way to the gum is much better in every respect than a full crown that has ledges about the upper border. These half caps are used only in bridging, and must be anchored securely, either in under-cuts or in small cavities.

4. *The All-porcelain Crown.*—This crown suggests *revolving* rather than *evolving;* it was the first and it is the last artificial crown. The first was nearly always a failure; the last is nearly always a success. I will take the Logan (see Fig. 5) as the typical all-porcelain crown. As respects strength, natural appearance, and convenience in setting, it is greatly superior to any shell crown made separate from the pin and anchored with cement or amalgam. The Brown crown (see Fig. 6) is also good, those for the bicuspids and molars being much better than those for the front teeth. The latter seem to me to have one radical defect; they enter the lower end of the canal too much like a wedge, the tendency being to split the root. Otherwise they are not inferior to the Logan, which in all

FIG. 7.

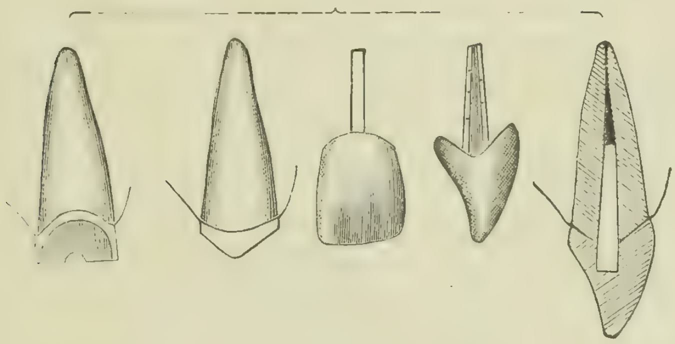
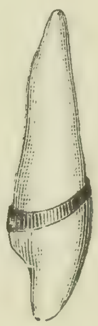


FIG. 8.



other points they resemble. In setting these, the root should be trimmed even with the gum or a little under it all around. After treating, excise or drill off the crown, then take in the engine a half-inch corundum wheel with a rounding edge, and hold it against the center of the root, which is trimmed until the edge of the gum is reached. It is always well, when this can be done, to press up the free margin of the gum by packing gutta-percha in the canal and over the end of the root. The canal should now be straightened with a Talbot reamer, slightly enlarged with a tapering fissure-drill, and then flattened from before backwards.

I can merely allude to the new Richmond crown (Fig. 7), which seems to me limited in application, since the root must have central length laterally, just where all roots are so frequently shortened by approximal cavities. This crown has been recently brought to the attention of the profession by Dr. W. S. How, whose descriptions and depictions are models of clearness and accuracy.

The ferrule can be used with these three crowns,—the Logan, the

Brown, and the countersunk. Dr. Stowell, in the DENTAL COSMOS for October, 1887, has given a concise description of his method of uniting these crowns to the ferrule,—a method which, though not very simple, has decided merits. I have been for some time practicing a method which has proved very satisfactory. It can be applied to any root that can be banded, but is especially well adapted to cases of relatively long crowns. The root must be short, and the ferrule should be quite narrow (see Fig. 8), so as to leave all possible space for the porcelain. The band is made and cemented in position with a hole in the cap or base-plate to admit the pin of a Logan crown, which is then ground in position and attached with gutta-percha in the usual way. It will be seen that the joint is between the gold and the porcelain, which should be ground close, so that the packing will be thin. I once modified this method to suit a frail central root by fitting a gold tube in the canal and soldering this to the ferrule. After cementing this metallic armor in place, I carefully fitted and attached a Logan crown, as already described. It may be said, "Why not cement in a ferrule crown at once?" I reply, the condition of the root and the health of the patient in this case made the chances of trouble too great for me to take any risks. Roots as frail as this one can seldom be banded.

Pins or Crown-anchorage.—When nothing but the root remains, artificial crowns are anchored around their necks, or in the canals, or both, the latter method being the strongest and most permanent. The first crowns were made separate from the pins. The screw has always been separate; but since neither the dentine nor any filling material can be made to hold a thread or retain a nut, besides being liable to split the crown, this apparently perfect anchorage has not come up to expectations. There is, however, one form of screw, the How "post," which has proved very serviceable. Again, pins have been split and spread and anchored by filling material, sometimes inside tubes or square boxes that had been cemented in canals much enlarged by decay. It will suffice to say that both these methods are well-nigh obsolete. There are, however, cases in which a tube set in a frail root with very hard cement answers a good purpose.

The most perfect pin yet devised is made of platinum and iridium. This makes a strong pin, that will rarely bend, and will not break.

In crowning, as in anchoring large approximal fillings, we aim to divide the strength of the operation between the tooth-structure and the metal. A slender pin will bend or break, while one too thick will weaken the root. The *shape* of the pin is even more important than its mere bulk. A pin set in cement can be short and square or round; but a pin set in gutta-percha should be long, taper

like the root, and oval or flattened at the sides. The improved Logan would be a perfect pin if the sides were slightly rounding instead of being depressed. A canal enlarged and straightened with a Talbot reamer, and carried a little forward and backward with a tapering drill a little smaller than the reamer, can be regarded as properly prepared for the perfect pin. Closely-fitted flat pins effectually prevent rotation of the crown.

Filling or Packing about the Pin.—The first pins were wound with cotton dipped in varnish, which flimsy device may have some years later suggested the debatable root-filling. The wooden pins often became "pivots," and when saturated with moisture became wedges and split the root; yet sterilized wood fills a canal better than cotton. I will take this occasion to modify what I have said in "The American System of Dentistry" respecting wood as a root-filling above the pin in crowning certain kinds of teeth. I do not find it better than gutta-percha. This is the only not well-tested method I took "on faith;" and I have also learned since writing the "Plastics" for the work just mentioned that gutta-percha is as good for bandless crowns as zinc phosphate is for those with a ferrule.

Amalgam is at once the most durable and most objectionable material for crown-setting, because it damages the pin and darkens the crown. Zinc phosphate is the best thing for setting ferrule crowns, because it can be forced through a very small crevice, and is quite permanent when protected from moisture. Gutta-percha is the best plastic for bandless crowns for these reasons: First, it can be easily and quickly attached to the pin; second, it fills the canal perfectly and holds the crown very securely; third, it makes the most impervious and imperishable packing for the joint; fourth, when necessary the crown can be readily removed.

Crowns must sometimes be taken off in order to obtain room to fill or refill cavities in the adjoining teeth or to insert a bridge; and cases have been heard of where it actually became necessary to re-treat the root, and that, too, whether the case was of immediate or remote crowning. Besides these points in favor of gutta-percha, its well-known qualities of being non-conducting and non-irritating are not out of place in a pulp-canal or an open apical foramen. Gutta-percha in some of its forms has always been considered a standard root-filling, and if a film of it could always be used as a non-conductor under gold or amalgam, all soft teeth could be made more durable and comfortable. When used to set crowns, the merest film is not only all that is needed, but is best in every case. Masses of this material are not desirable, on account of its capacity to absorb the fluids and gases of putrefaction. When canals are much enlarged by decay, as shown in Fig. 5, zinc phosphate and gutta-

percha should be combined in this manner: remove all softened dentine from the canal, leaving the walls rough or slightly under-cut; next thoroughly dry and fill with the cement, then pass through this a tapering and slightly oiled instrument a trifle larger than the pin. When the cement is hard a film of gutta-percha can be worked around the pin and over the end of the crown in the usual manner. Again, gutta-percha, being very slightly yielding, may be regarded as a kind of secondary artificial peridental membrane, which will tend in some slight degree to relieve concussions and break the force of mastication. To obtain the best results with gutta-percha, these points must be observed:

1. The gutta-percha is put *on the pin*, and not in the canal, except a very little to close the foramen.
2. The pin must be finely barbed on its corners with a sharp knife.
3. The gutta-percha is softened carefully over the flame of a spirit-lamp, and flattened out and quickly worked around the heated pin, both being as hot as can be handled.
4. The pin is now promptly passed into the canal, and quickly removed, and gutta-percha added or cut away, until by three or four trials the exact amount is determined and the *end of the crown* perfectly covered.
5. The canal is now grooved with a wheel-bur, and thoroughly dried by absorbents; hot air is then applied until the end of the root is white and the patient feels the heat, when the crown with the gutta-percha slightly warmed is at once placed in position

If proper care has been taken, there will be no excess about the joint to trim away. This packing in the joint should be very thin, and as nearly as may be of a uniform thickness,—a point that should be noted when making trials to determine the amount. The gutta-percha which according to my experience combines at once the desirable *hardness* and *softness* is the "Premium," prepared by The S. S. White Dental Manufacturing Co. As an illustration of the holding power of this material, I have had several cases of crowns set temporarily which were removed with difficulty by the aid of a hot instrument repeatedly applied; and I have one instance each of the Logan and ferrule crowns which I failed to remove at all. I have learned by these experiences not to cut a thread in the canal until the crown is set permanently.

As to the *expansion* of gutta-percha causing roots to split, which is claimed by at least one of our most scientific men, I have yet to have the first proof from experience; but, then, my experience may not be extensive enough. I have among my friends three or four cases in which I attached Logan crowns to the frailest kind of lateral roots, and I am watching these to see what there is in the idea

that gutta-percha is very liable to produce the worst of all accidents in crowning; for, of course, no disaster that befalls a structure can be compared to the loss of its foundation.

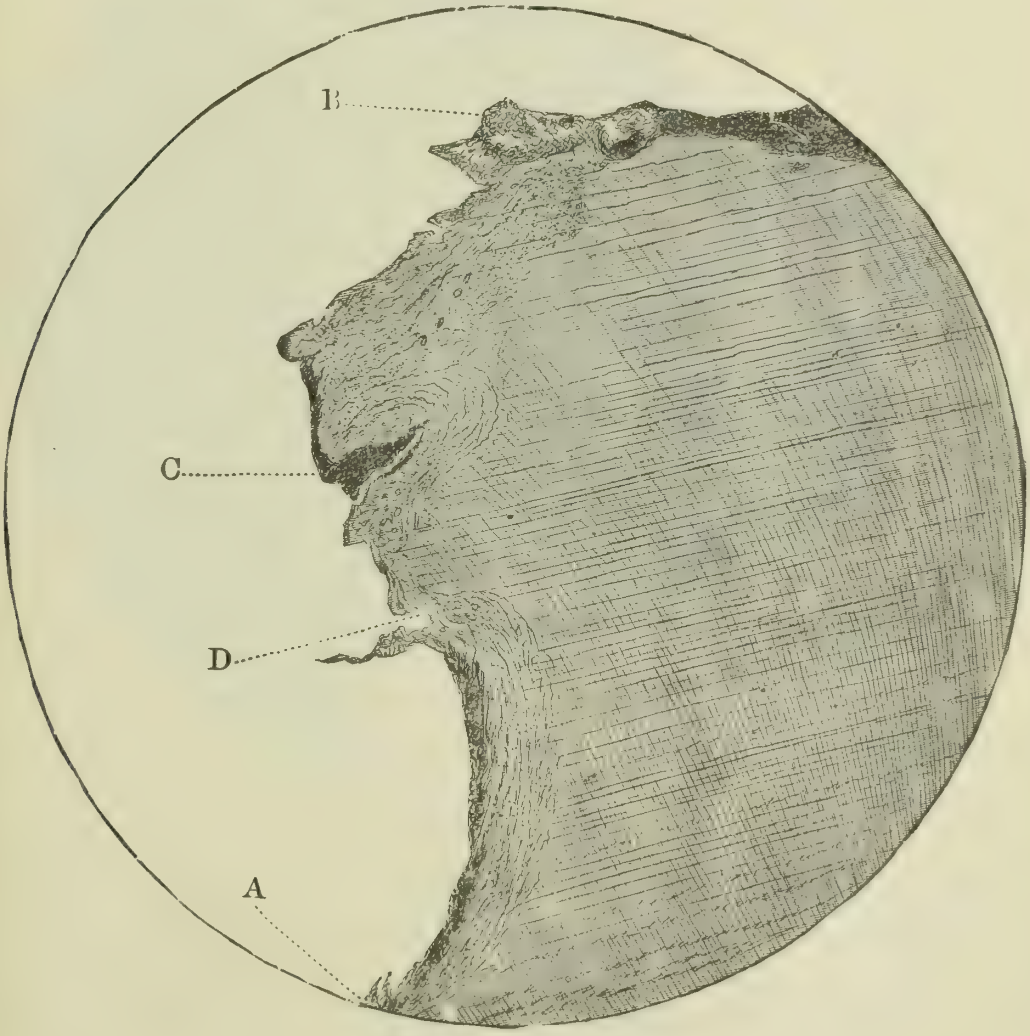
MICROSCOPICAL EXAMINATION OF AN IMPLANTED TOOTH.

BY G. L. CURTIS, M.D., D.D.S., SYRACUSE, N. Y.

Read at the Nineteenth Anniversary Meeting of the First District Dental Society of the State of New York, January 16, 1888.)

On October 12, 1886, I successfully implanted a superior second bicuspid in the jaw of Miss B., aged twenty-five years. The natural tooth had been lost seven years before this operation, and the tooth implanted was extracted two days previous to its use by me. On July 23, 1887, I extracted the implanted tooth. It had been

Fig. 1.



Magnified 100 diameters.

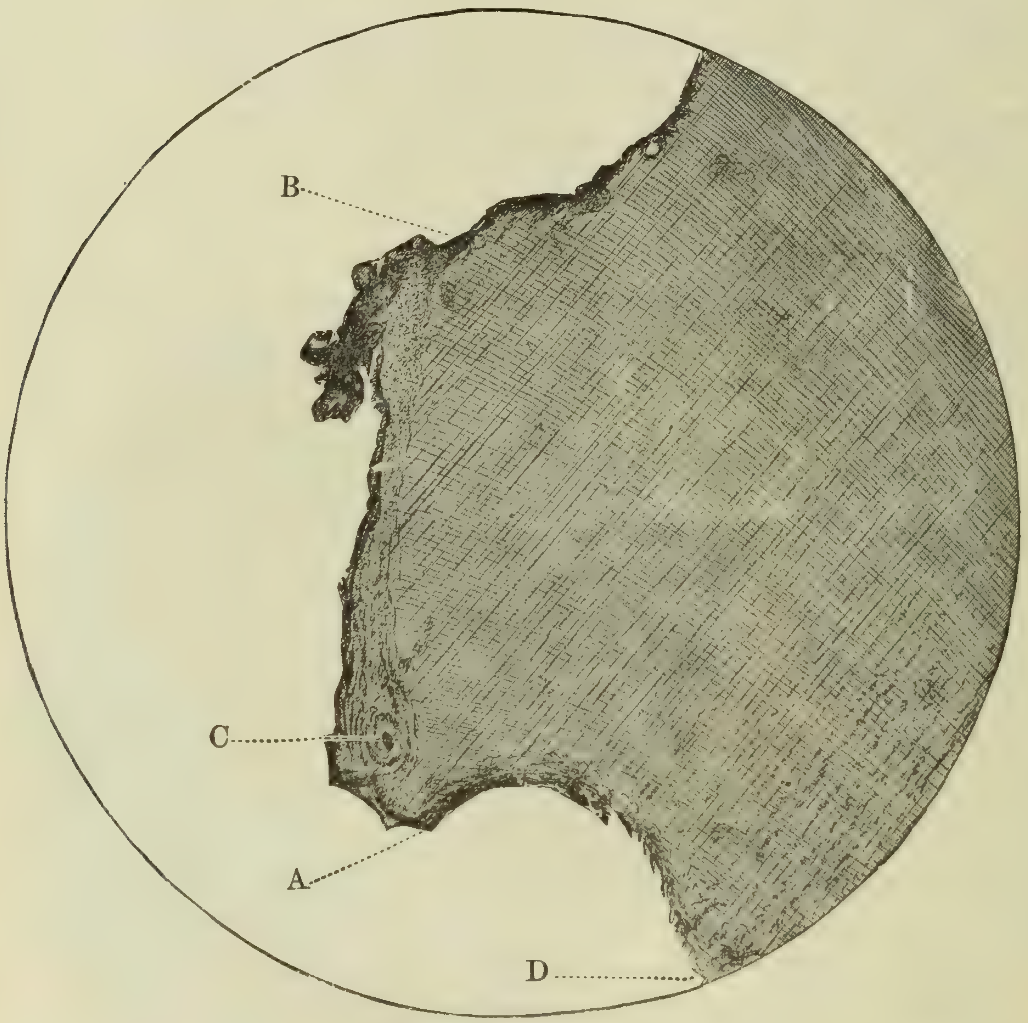
in active service for nine months, without the slightest inconvenience to the patient, and without manifesting any unfavorable symptoms. The tooth was so firmly imbedded that it was necessary to break it off, and split the root and remove it in sections. An anes-

thetic was used, as the operation was necessarily painful. The socket was then deepened, and a larger tooth implanted.

On a recent examination, the tooth was found to be firm, the surrounding parts in normal condition, and the stranger restored to actual life and health. The patient has the same full use of this as of its predecessor.

The extracted tooth, consisting of crown and upper two-thirds of root, was at once placed in Mueller's fluid (℞ Potass. bichromate, 2½ parts; soda sulphate, 1 part; aqua, 100 parts). After remaining in

Fig. 2.



Magnified 100 diameters.

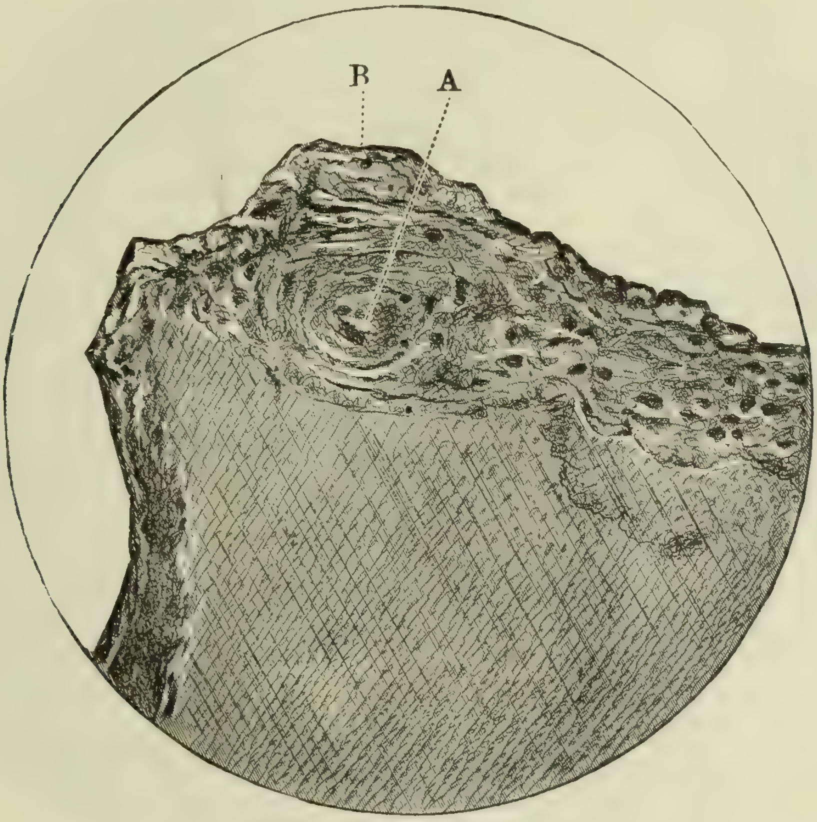
the solution a sufficient time, the tooth was decalcified, sections prepared, and a microscopical examination made.

Fig. 1 shows section of middle third of root; A representing where lower third was broken off; B showing spot where cementum was destroyed before implantation, or, after implantation, during process of repair. The dentine is found to be in a normal condition, the fibers are not shrunken, and the whole presents the appearance of a like section of a freshly extracted tooth. Toward the lower part of root, between A and D, the cementum is greatly

thickened, and has become converted into a dense fibrous connective tissue, partially calcified; between D and B this fibrous connective tissue has become converted into true bone, connected directly with the dentine-fibers. So intimate is this connection, that it is impossible to say where bone begins and the fibers of dentine end. This formation of bone contains bone-corpuscles and Haversian canals; one of the latter is shown at C.

Fig. 2 is a section from a different level; B shows limit of root where broken off. Between A and B corresponds to like position in Fig. 1. In this section is seen no fibrous connective tissue as in Fig. 1; between A and D all is converted into bone. At C is

FIG. 3.



Magnified 250 diameters.

shown a transverse section of an Haversian canal, with its concentric lamellæ. Between A and D corresponds to B in Fig. 1, showing spot destroyed before or after implantation.

Fig. 3 shows same field as Fig. 1, more highly magnified; bringing into prominence the bone-corpuscles as seen at B and showing the Haversian canal, with its concentric lamellæ A.

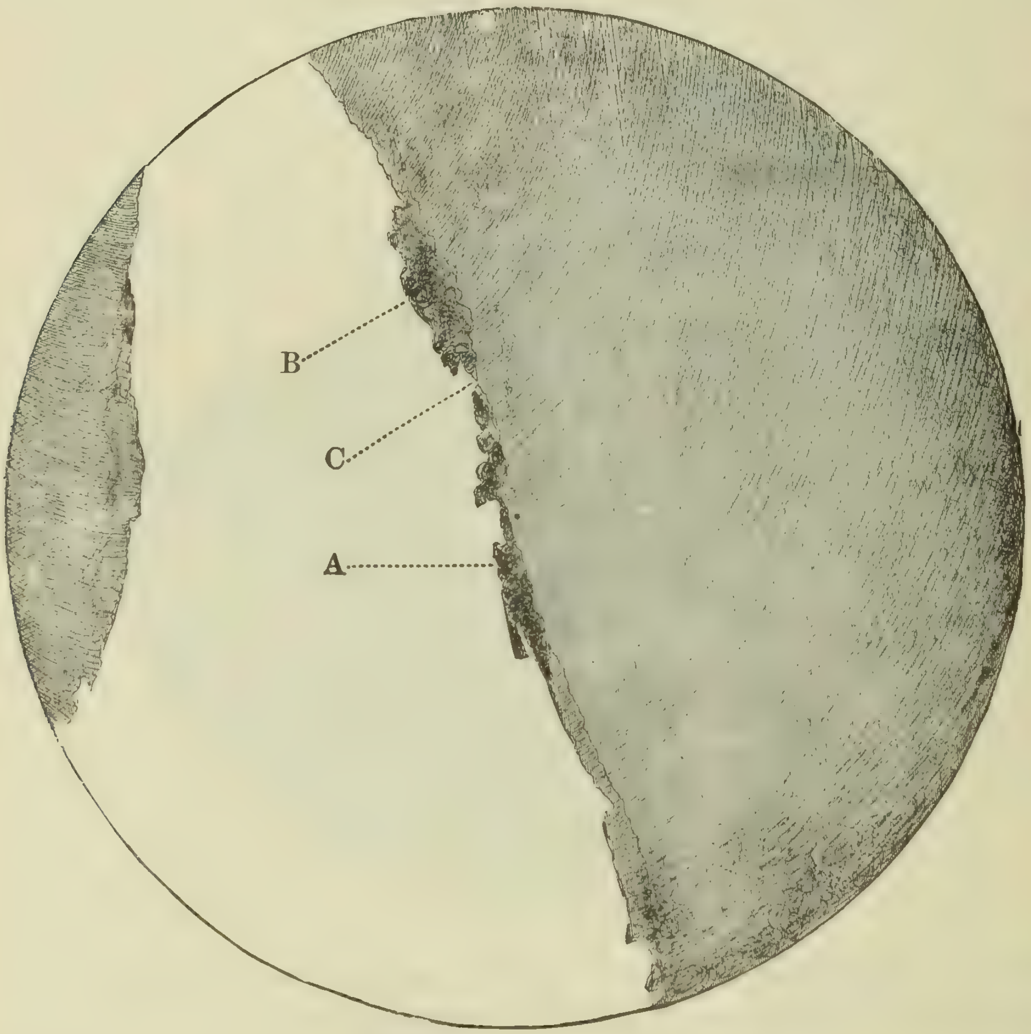
Fig. 4 shows the pulp-cavity; between A and B is seen a mass of filling under which lie the revived odontoblasts.

Fig. 5. Same field more highly magnified, A showing odontoblast; B B, masses of filling. The cementum of the upper portion of the root is normal both in the size and appearance of its cells. A small piece of alveolus, detached with tooth, presents no trace of a

peridental membrane, but shows a highly vascular condition, and also a proliferation of connective-tissue cells.

For the preparation of these specimens, the photo-micrographs, and for expert assistance in their examination, I am indebted to W. M. Gray, M.D., microscopist to the Army Medical Museum, Washington, D. C. It should be added that said specimens cannot cast any light on the question whether the gum adheres to the implanted tooth, but from clinical experience I am inclined to the opinion that it does not. This point, however, will be conclusively demon-

Fig. 4.



Magnified 100 diameters.

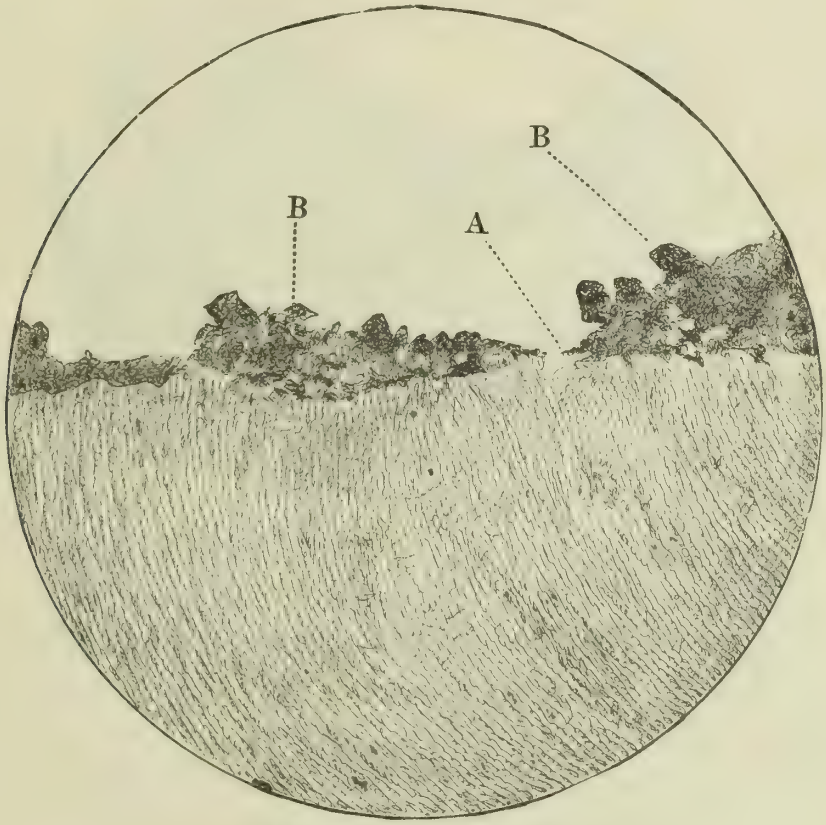
strated from the outcome of experiments which I am now making upon the lower animals. In these, sections of teeth in position will be submitted to microscopical examination.

I may further say that, had the tooth subjected to experiment been unbroken, more points could have been proved. Had the tooth been whole, it could have been demonstrated whether the ossification extended the entire length of the root. In my opinion, it did. I believe that in this case the fixation of the tooth was caused by the reproduction of the bone-tissue of the alveolus. The inflammation

consequent to the formation of a socket produced an infiltration of osteoblasts or bone-corpuscles into cement-substance. The outcome of this process is bony anchylosis. I also believe that the cementum, in fact the whole tooth, was resuscitated; otherwise, how could we get the normal conditions found to exist in the specimen examined; and especially, how could we explain the presence of the mass of cells near the pulp-cavity? These cells demonstrate conclusively that the tooth was active.

In a paper read before the New York State Dental Society in May, 1887, I held as a reasonable theory, in view of the physiological changes in the repair of bone-tissue, that in a case of implantation, where the tooth has been firmly held in place until fixation ensues, and where nature has been allowed to take her course, nothing short of true bone could exist, and that the union would be that of bony anchylosis. The examination, the results of which have been presented, demonstrates this theory by showing that an osseous union, or bony anchylosis, does exist.

FIG. 5.

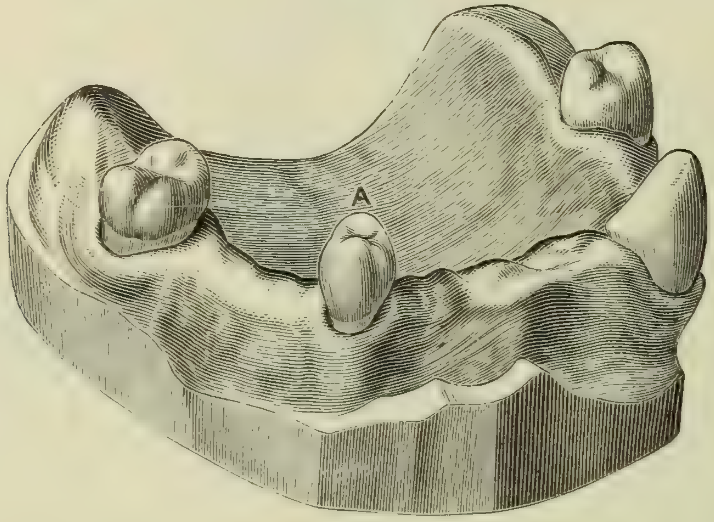


Magnified 250 diameters.

In the paper to which reference has just been made, I suggested the advantages of implanting teeth as supports for a bridge. May I be permitted, in closing, to report a case in which I have carried into effect this advanced practice with eminent success? The patient, whose age is forty-nine years, had remaining in his upper jaw only three teeth,—the left second molar, the right cuspid, and the second

right bicuspid. To these I desired to attach a bridge, a full upper denture, but decided that the space between the molar and the cuspid was too great to obtain a safe and serviceable result. Accordingly, I implanted a freshly extracted tooth in place of the left cuspid, which was lost six years previous. The cast herewith presented (Fig. 6) shows the condition of the jaw six months after the implantation. The happy results attending like operations were obtained here, and the new tooth was firmer than any of its neighbors in the upper jaw. A bicuspid was selected for this operation, that occlusion with the inferior cuspid might be accomplished; thus

Fig. 6.



it was held in position. A bridge consisting of thirteen crowns has been successfully attached to these four teeth, and to-day it is doing actual service, to the comfort and delight of the patient and to the operator's satisfaction. Other dentists who have watched this revolution express absolute satisfaction with it. As far as I know, this is the first case where a tooth has been implanted to support a bridge. In view of this fact, does it not seem practicable that plates can be done away with, whether few or any teeth remain in the jaw? And may we not advance a step farther, and implant full sets of natural teeth?

CORRESPONDENCE.

AN INTERNATIONAL DENTAL CONGRESS.

To the Editor of the Dental Cosmos:

Dear Sir: The March issue of the *Dental Review* has an editorial calling attention to the necessity of at once taking steps to convene an International Dental Congress. It is therein insisted that no antagonism exists between this scheme and the dental and oral

section of the medical congresses which have been or are to be held, and the idea is conveyed that there is a crying need for such a convocation.

Those who have kept track of events which have transpired are aware that in two medical congresses there has been a section in which dentistry was represented to the fullest extent. They are also aware that the last one, held in Washington, was given but feeble support in certain quarters, and was ridiculed and belittled in others,—and by none more so than by the editorial management of the *Review* itself, which spoke of it in terms of disparagement, saying that the matter presented was not new, was not properly presented or discussed, and as to the general literary programme, it kindly proposed to "draw the mantle of charity over it."

It was generally supposed that this repeated recognition of the status of dentistry would settle the question; but if anything more were needed to do so, it is found in the action of the American Medical Association, which at its late meeting in Chicago recognized dentistry as a specialty of medicine, and it is now or soon will be generally so regarded by the medical profession. How in view of these facts the editor of the *Review* can say that he does not know whether or not it is purposed to organize a dental section in the medical congress to be held in Berlin, in 1890, is not very plain. He might with equal propriety say he "does not know" whether or not there will be a section on surgery or gynecology, or any other specialty, for the dental section stands on precisely the same footing as any other, and nothing said or done heretofore indicates that it will ever be otherwise; and from the fact that it was admittedly conducted in such a manner as to command the respect of the entire congress, it is absurd to intimate that the section will not be continued in future congresses.

How any separate congress could in any way add to the interests, dignity, or usefulness of dentistry is not manifest,—nor is it evident that "the indications are plain that such a congress is demanded." The main argument advanced for it is that certain matters can only be considered in a "dental congress;" but why is not a dental section in a medical congress to all intents and purposes a dental congress?

There is absolutely no need for a dental congress, and no demand apparent, except such as may have been or may be excited by parties having their own ideas as to its management and control. That any such need will exist, so long as a dental section is a recognized part of the medical congress, is not at all probable. That this section will be perpetual, there is no better authority than Dr. N. S. Davis, president of the recent medical congress held in Wash-

ington, who in an editorial in the *Journal of the American Medical Association* says, under the heading, "An International Dental Congress,"—

The *Dental Review* of March 15, 1888, in advocating the holding of "An International Dental Congress at Paris, France, in September, 1889," disclaims any intention of interfering with a section of Dental and Oral Surgery in connection with the Tenth International Medical Congress to be held in Berlin, 1890. Notwithstanding this disclaimer, it is difficult to see how the editor of the *Review* could more directly and certainly interfere with the organization of an efficient and successful dental section of the International Medical Congress in Berlin, than by persisting in his scheme of forestalling it, by a separate International Dental Congress the year preceding in Paris. The full recognition of properly educated dentists by the successful organization of a section of Dental and Oral Surgery, as a part of the great International Medical Congress at London, in 1881, and its repetition with still greater success as a part of the International Medical Congress at Washington, in 1887, leaves no room for doubt about the purpose of organizing a similar section in the next congress at Berlin, and of its permanent recognition as a legitimate department of the great field of medicine and surgery. Then why should not every enlightened member of the profession use his influence for perfecting the unity of all the departments, and the promotion of such harmony in the organization as will afford mutual support and mutual advancement? There is no interest, social, scientific, or practical, to be promoted by an exclusive International Dental Congress in Paris next year, that could not be more efficiently promoted by a section of the International Medical Congress the following year at Berlin. The published proceedings of a congress of dentists will reach but few outside of its own members, while the work of a section becomes a part of the published transactions of the general congress, and thus receives a wide distribution to members of all other sections, and *vice versa*, the work of all other sections becomes the property of the members of the dental section. So true it is, that coöperation and union impart strength and diffuse knowledge, while segregation and exclusiveness limit both.

With this statement there can be no reasonable doubt that there will be a dental section in the congress of 1890. To hold a dental congress in Paris in 1889, then a section in Berlin in 1890 (equivalent to a dental congress), and then a dental congress in the United States in 1892, as the *Review* proposes, would be virtually holding three international congresses in four years, one every eighteen months. Unless the real object of the projectors of the dental congress is to prevent the organization of a dental section in the next medical congress, the proposition is short-sighted and absurd. If, however, such is the object, it will hardly receive the support of right-minded men.

C. Stoddard Smith.

Chicago, Ill., April 9, 1888.

PROCEEDINGS OF DENTAL SOCIETIES.

NINTH INTERNATIONAL MEDICAL CONGRESS.—SECTION XVIII. DENTAL AND ORAL SURGERY.

(Concluded from page 193.)

FIFTH DAY—*Evening Session* (*Concluded*).

THE secretary, Dr. A. M. Dudley, read a paper by Dr. I. B. Davenport, Paris, France. Dr. Davenport's paper was entitled "Harmony and Discord; Health and Disease; Healers and Hinderers," and was a plea for the preservation of the masticatory apparatus in as nearly a normal state as is possible. To remove a tooth, except for the gravest reasons, one must assume that all the biological relations between that tooth and all the surrounding parts are unimportant. Nature's abundance in the supply of teeth is limited to man. He had not seen the teeth all lost before the age of twenty years without the aid of man. By man's aid he had seen the march of disease exceeded and the jaws stripped of every tooth that had dared to erupt before the age of sixteen years had been reached; but that does not prove that nature is prolific in tooth-supply. The importance of the loss of a tooth from the masticatory point of view is not simply in proportion to the ratio of grinding surface which it removes,—unless at the end of the arch,—but depends upon the total disarrangement which it will cause in the remaining teeth. The loss of the first molar removes a large share of the grinding surface, and so causes much immediate disturbance of the function of mastication; but that is of slight importance compared with the effects produced on the other teeth, as the robbing them of their support, and the loss of function due to their tipping out of relation. In many mouths an extraction may ruin the articulation on the only side capable of mastication, owing to imperfect arrangement. The writer believes that an enormous proportion of all the disarrangements of the articulation of modern teeth have been directly or indirectly caused by bad dentistry,—bad because opposed to the natural laws and forces governing the arrangement of the teeth. There is a tendency among dentists to classify cases and formulate the principles of practice into set rules. Authors must classify cases and treat of them in groups, but in practice the dentist deals with individuals and not with groups, and he should adapt the treatment according to the fine variations of his cases.

Dr. Atkinson would say of this paper as the proof-reader marks a phrase which he cannot improve, "Stet,"—let it stand.

Dr. George Cunningham, Cambridge, England, read the paper

which he had announced at the afternoon session of the first day of the Congress. The paper bore the title "On the Curability of Pulpless and Abscessed Teeth, mainly by the Immediate Method, with Statistics of Cases." Dr. Cunningham said that since hearing the strictures on Dr. Cravens's paper he was more than glad that he had tabulated from his practice the statistics which he should present. The essayist quoted at some length from a paper on "Dead Teeth treated by an Antiseptic Process," read before the British Dental Association in 1882 by Mr. Alfred Coleman. Mr. Coleman's method was to remove all the softened dentine and the contents of the pulp-cavity, but not those of the roots, syringe well and dry, and apply carbolic acid on cotton, which was allowed to remain for a few minutes while the filling was being prepared; then remove the carbolic acid, again dry the cavity, and place over the root-canal or canals, as the case may be, a disk of stout writing-paper, moistened with carbolic acid, the side of the disk toward the pulp-canal carrying from one-twentieth to one-fifteenth of a grain of arsenic. The pulp-cavity was then nearly or quite filled with zinc-oxychloride, and when this had set the operation was completed with any suitable filling-material. In molars and where there was a possibility of a second application of the arsenic being needed, gutta-percha was used as a temporary filling. Dr. Cunningham had endeavored in the treatment of these cases to make a compromise between the practice advocated by Mr. Coleman and the methods which he had been taught in this country. In the dressing method he employed eucalyptus oil, alone or combined with iodoform, creasote and iodoform, oil of cloves, carbolized resin, tincture of aconite, and oxychloride of zinc. Of 122 teeth thus treated (74 with eucalyptus oil or eucalyptus and iodoform) 6 were afterward extracted, a percentage of four and a fraction. He did not claim that this was all that were extracted, as, living in a university town, where students were coming and going, necessarily many cases passed from under his observation. Another thing noted was where the patients returned with periosteal trouble. Of these there were 36, a percentage of 29.5; and the number of subsequent swollen faces was 32, a percentage of 26.2. In treating by the immediate method the first dressings were arsenious acid and oil of cloves, applied by taking the merest shred of cotton-wool on a fine nerve-bristle, which was dipped in the oil of cloves and simply touched at the end with the smallest possible portion of the arsenious acid and then carried up toward the apex of the root as far as he thought it safe to go. No deleterious results are likely to follow this method if care is taken in the manipulation, the quantity of arsenic being so small. But to make the method more exact, he made a 1 per cent. solution of

arsenious acid in glycerin, using a sand or water-bath to promote the solution of the acid crystals. This was employed in 165 cases. A 2 per cent. solution of arsenious acid in alcohol with oil of cloves, equal parts, was also used. Bichloride of mercury, 1 in 1000, was used in 45 cases, and a stronger solution, 1 in 100, in 75 cases. Other agents were also used, by the writer and his brother, the total record of cases treated by the immediate method showing 512, of which the number of known extractions was three, two of which were marked "forlorn hope" at the time of treatment, the third being removed partly for artificial work, though it was loose, a curved root having been accidentally perforated in drilling out the canal, thus allowing the dressing to protrude, which set up a chronic periodontitis. There were 6 cases of subsequent slight periostitis, as against 36 by the dressing method, or a percentage of 1.152 as against 29.5. There were also 5 cases of swellings or abscesses treated subsequently, as against 32 by the dressing method, a percentage of 0.976 as against 26.2. These figures are not to be taken as exact, for the reason before mentioned, but so far as they go they represent faithfully the results of the two methods of treatment. Under the dressing method only 2 teeth out of 38, a percentage of 5.26, were permanently stopped at the time of filling the root-canals; whereas under the immediate method 61 out of 150, a percentage of 40.66, were permanently filled at once. The rubber-dam is recorded as being used in 200 of 270 cases, or about 75 per cent., by the immediate method, and in 52 cases out of 153, or 33 per cent., by the dressing method. To give some idea of the number of cases seen again, one case-book shows that 70 of 114 were seen again; another, 66 of 109; and a third, 40 of 49. He believes that the total extractions under the immediate method, making a liberal allowance for the patients who have consulted other practitioners, has not exceeded 2 per cent.

His conclusions are: 1st, That under the immediate method there were fewer extractions and failures; 2d, That there were fewer subsequent attacks accompanied by swellings and acute abscess, and that therefore this treatment is attended with less pain; 3d, That the immediate method requires less time than the old method, the average time of treating and filling a tooth being considerably under an hour; 4th, That by the immediate method more desperate cases can be saved, many of those recorded having had large perforations of the roots, while others had been condemned as utterly hopeless; 5th, That the method rather than the medicines used had a good deal to do with the results, as probably the operation would have succeeded equally well in many cases without any medicine whatever; 6th, That owing to the difficulty of diagnosing such cases it is better to conduct

every operation with all antiseptic precautions; 7th, That casualties, such as perforation of the root, are fewer, probably because of the less complete removal of the contents of the root-canals.

Dr. S. T. Kirk, Kokomo, Ind., had used oxychloride for filling root-canals for several years, and then tried gutta-percha, which he had found uniformly successful. He does not believe in enlarging the canals with drills. A canal which is large enough to admit a drill does not need enlarging.

Dr. W. B. Ames, Chicago, described a method of preparing the roots which he had been practicing for five years in cases where the canal was to be immediately filled. It depends for its success on the thorough disinfection of the canal. This method is to decompose the contents when fluid by electrolysis, or to flood with an acidulated solution and pass fine electrodes as near to the apex as possible, and then use reamers to clean out the débris.

Dr. A. E. Baldwin, Chicago, does not object to the immediate filling of root-canals, but rather favors it, provided that thorough dryness is secured at the apex. Where treatment is necessary, it is better applied from the outside. He believes that more harm than good is done by the use of many of the medicines recommended, such as germicides.

Dr. G. D. Sitherwood, Bloomington, Ill., was gratified to know that what has been his practice is so strongly indorsed. He fills at once when it is practicable, and sometimes has failures, but he believes so much depends on perfect cleanliness in these cases that when a failure occurs he changes his course so as to provide for securing cleanliness, and then has usually no further trouble. He thinks most dentists do not fill at a single sitting.

Dr. John C. Storey, Dallas, Texas, felt that the very great success reported and the many methods described for filling pulp-canals confirmed his belief that it don't make much difference whether they are filled at all. He does not use drills.

Dr. J. E. Cravens, Indianapolis, Ind., wished to thank Dr. Fillebrown for the fair manner in which he had discussed his paper, but some of the points made demanded a reply. In the essay he had said that if at the time of presentation the tooth is too sore to admit of the operation of opening the pulp-cavity for initial relief, the policy of waiting is always preferable to trying to force a conclusion by medication, and in the end is more expeditious. When he has to refer patients to a later time for operating he gives instructions so that they can reduce the pain, and when they return they will usually bear any manipulation. He is not afraid of locking up septic conditions by his method of treatment. Impenetrable canals, those which are too slender to be filled in the usual way, can

be filled with shellac varnish with a bristle cut from a brush and left in the canal. Phosphate of lime is not always used as a medicine when employed for filling. In the first place, it answers a mechanical purpose; and in the second place, the magma is readily adapted and will not interfere with resorption. The subject of the essay was inspired by reading a monograph on the management of pulpless teeth issued by the Odontological Society of Chicago. It requires some courage to pursue such a method as the speaker advocates, in the face of the well-known opposition of so many in high places, especially in the first few cases, but the results will justify the treatment.

Dr. W. P. Horton, Cleveland, O., gives nitrous oxide in painful cases. After a few inhalations the cutting can be proceeded with without pain to the patient.

The secretary, Dr. Dudley, read papers by title by Dr. W. St. Geo. Elliott, London, Eng.; Dr. W. J. Younger, San Francisco, Cal.; and Dr. E. C. Moore, Detroit, Mich.

Dr. J. Rollo Knapp, New Orleans, offered a resolution that a committee of two be appointed to prepare a suitable testimonial to Dr. N. S. Davis, for his efforts to advance the interests of dentists. Adopted unanimously.

On motion of Dr. W. H. Dwinelle, New York, it was ordered that a committee be appointed to prepare a similar testimonial to Dr. Taft, president of the Section.

Dr. Taft returned his thanks, and referred to the differences of opinion which have prevailed as to the Congress, and the degree of success which it has had. He felt that he owed a vote of thanks to those who had attended the Dental and Oral Surgery Section, and he certainly appreciated the manner in which the work of the Section had been done. There had never before been a body of men representing dentistry from all parts of this country and from almost all other countries working harmoniously together to upbuild the science and art of their chosen profession. What will the result be ultimately? Certainly grand fruits shall grow from the seed planted here. The benefits will not stop with those who have been here, but the reports will go out wherever the art of dentistry is practiced. No man can tell what the gain to our patients will be. Other Sections representative of the other branches of medicine have been in session, and many of the gentlemen in attendance on them have expressed the opinion that this Section is one of the best of them. The attendance on the first day was about 420, and it is now almost as large as the average of the five days.

Dr. George Cunningham, Cambridge, Eng., felt that the work of the Section would not be complete if they failed to return thanks

to the Executive Committee and the secretaries of the Section. He had personal knowledge of how much they had been harassed, and he heartily appreciated what they had done. He therefore offered a resolution of thanks, which was adopted by a rising vote.

Adjourned *sine die.*

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting Tuesday evening, February 14, 1888, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street.

The president, Dr. J. Morgan Howe, in the chair.

The President. Gentlemen: We are a little embarrassed this evening with a multiplicity of good things, and several gentlemen have consented to postpone their reports of interesting cases until the next meeting in order to give Prof. Flagg more time. Dr. Perry has his light-condenser here, which he will show you.

Dr. Perry exhibited and explained his apparatus for condensing light for operating purposes. It consists of a large lens of great refracting power arranged upon jointed rods so that it can be adjusted at any distance or angle, and is available for both daylight and artificial light.

Dr. Dwinelle. There have been a great many devices for illuminating the mouth, but I think this apparatus of Dr. Perry's will supersede the others.

Dr. Z. T. Sailer. In calling your attention to this mode of setting crowns on natural roots no claim is made for any new principle, but simply the application and combination of the good contained in two widely different modes that have been very favorably considered and extensively practiced by the profession for many years. From one is taken the sheath and the split pin, so called, the objections to which as used heretofore are well understood: the liability of the root to split, decay, etc. From the other method is taken the band, which, when used in connection with cement or gutta-percha, often causes difficulty in obtaining a perfect adjustment of the finished crown, for if there be too much or not enough of the holding agent used the crown either does not go to its proper position or the greatest amount of strength is not obtained. A degree of uncertainty also attends such operations, and time alone can determine whether they have been successfully performed or not. With the mode presented for your consideration uncertainty is, comparatively, done away with. This crown consists of the following parts: A

gold and platinum metal pin, made of two pieces soldered at the end that is to project out of the root; a sheath for the pin, made of very thin platinum; a gold band capped with platinum; a porcelain crown, or for back teeth the gold band can be extended into a gold crown. The steps usually taken in setting this crown are as follows: The root is shaped and band fitted if the root is not decayed to the outside edge; if it is, the canal is prepared to receive the smallest pin that has the strength required, then the sheath with pin in is fastened in the root by packing amalgam around it and the decayed portion built up. It is not deemed requisite to cut away the tooth-substance so as to have a large body of amalgam around the pin, as more strength can be had by saving as much of the root as possible and having just sufficient space around the sheath to enable the amalgam to encircle it. As to the depth the amalgam should be packed into the root, that depends altogether on the case, one-eighth of an inch often being sufficient. With the pin in position and the band made, a hole is bored through the cap to correspond with the position of the pin; the band to which the cap is attached being then placed in position and waxed to the pin, both are removed and soldered. This is the most delicate and difficult part of the operation, for if the pin and band are successfully removed without disturbing their relation one to the other and so soldered they will always work in perfect harmony with the other parts and can be taken off and replaced as often as necessary, and always with the confidence that they can be put in their proper position every time. The impression can now be taken, the tooth ground, backed, and soldered, and if every step has been taken with the necessary care and exactness the result will be undoubted. In placing the crown in position for the last time a small portion of liquid gutta-percha is used around the edge of the band to drive before it and also to keep out any moisture that might possibly, otherwise, get in. Among the advantages of this mode may be classed its mechanical accuracy and proportionate certainty of success, the comparative ease with which it can be removed and the root medicated if required or the crown replaced in case of breakage, and the possibility of putting a *durable* crown on decayed or broken roots. These crowns are also very strong, the bearing being equally distributed in the centre and around the circumference of the root, which gives all the strength that it is possible to obtain, mechanically considered. As Dr. Farrar calls his system of regulating teeth the "positive system," so this may be called the positive system of setting crowns (one or more) on natural roots.

The President. Gentlemen: It gives me great pleasure to introduce Prof. J. Foster Flagg, of Philadelphia, who will address us this evening upon the subject of

Gutta-Percha; A Permanent Filling-Material.

Dr. Flagg. Mr. President and Gentlemen: It is always with especial pleasure that I come to visit the New York Odontological Society, because, as I stated to you just ten years ago, I seem to regard the Odontological as the typal society of the United States. I have oftentimes said that I would rather present a subject before this society than before any other. My reason for this now is the same which I had ten years ago, when, after long years of hard work in the study and manipulation of plastic materials, I desired that, as the ending of my private work and the beginning of my public work, the enunciation should be made before this body; for it seemed to me that this society carried a sense of weight about it. There was a great deal of talk in those days about "men of respectability," and it seemed to me then that it was a voucher of one's respectability that he should speak before the New York Odontological Society. And notwithstanding all the animadversions that have been made from that time on by some individuals, the fact that I have been invited to come here and speak to you is an evidence that I have maintained my "respectability."

I appeared before you then as a plastic specialist, for I had not used gold in my practice for two years. The position that I occupied then has been, as many of you know, much misrepresented, although perfectly understood. My intimate friends have never seemed to lose their respect for the position I have taken, for they knew why it was I had taken it. Ten years ago I said to them that I had to the full only those soft teeth under my charge which seemed to me to indicate the requirements of a plastic filling. I had been sixteen years working upon plastics to arrive at that peculiar result; and if I had been sixteen years working in this direction with a diminution of only six per cent. per annum in my practice of gold, in order that I might concentrate my energies entirely upon my work in that one field of dental practice, it certainly was nothing extraordinary that after all that time I should have arrived at "no gold used." If I had abandoned all other kinds of work except gold work I should have arrived at the result of "nothing but gold;" I should have had no teeth under my charge except strong live teeth of good structure; and for such teeth, and with cavities in accessible positions, gold is the king of filling materials. That is an opinion I have always held and the position I have always enunciated; but at the same time feeling that there was a large and ample field of work in connection with other kinds of cavities in other kinds of teeth. Little by little I urged this upon the attention of dentists, and the good teeth that could be safely filled with gold I sent to other men, because I had more

than enough, and I begged all my friends to send to me all those teeth which they had decided to extract and to save which the patient might prefer to have an effort made; I told them I would undertake the work of saving such teeth, with a definite purpose, which was to learn and teach how to work with plastic materials in that direction. Since that time ten years have passed, and with one exception I have not put in a gold filling in my office.

Now if I could not make that statement I would not be before you to-night. I would not be here to urge upon you once more a consideration of the peculiar tenets of the New Departure, which, contrary to the opinion of our mutual friend, Dr. Bonwill, has never, to my knowledge, been chilled by any "cold wave," but has, from its birth, increased grandly in its fair proportions, nurtured by most genial sunshine both professional and social. Efforts to impede its progress have indeed been made, but they have been swept away like mere straws in the path. The "trio" were "honest in their convictions," and honesty has proved itself a winning policy. The trio *never* has been in the least "discomfited." It *never* has been made to recant by modifying its creed. You all know, who know anything about the matter, that not one single jot or tittle of that enunciation has in these ten years been retracted in the slightest degree; but, on the contrary, I think I may safely assert that its influence has been shown in a modification of the practice of almost every dental office in the world.

In this city, one year ago last October, a gentleman from Boston read a paper before the First District Dental Society upon gutta-percha, which made me yearn to speak to this Society upon that subject. He gave a "rolling pin" and "old towel" mode of manufacture! A caje-putty mode of filling! He did not know of shrinkage! He could not tell "anything of the desirability of gutta-percha." In short, it seemed to me so half-hearted and ignoble an effort for so grand a material as gutta-percha, that I classed it as *another addition* to that *peculiar* list, "The Harvardian contributions to dental science!"

Now again I refer to the tenet of the old "accepted creed" which says that gutta-percha properly used is an excellent temporary filling. That was the universal enunciation ten years ago. It is not now. There are many respectable gentlemen who now think—agreeing with the enunciation of the New Departure ten years ago—that gutta-percha when properly used is the most permanent filling-material that we possess.

"Just in proportion as a tooth *needs* saving, gold is the worst material that can be used." To-day that stands as solid as a rock. In proportion as a tooth *needs* saving,—not in proportion to the size of the cavity, not in proportion to the position of the cavity, but

just in proportion as the tooth *needs* saving,—gold is the worst material you can use in it.

Here also gutta-percha stands, precisely as it stood then. Dr. Hawes, with whom I have stood shoulder to shoulder for almost fifty long years, came to Philadelphia ten years ago, because he had heard that I was going to say before your society that gutta-percha was the most permanent filling-material we possessed if properly used. I showed him gutta-percha fillings that were seven years old, and one ten years old, which he pronounced very nice. I then showed him one fifteen years old; and finally I showed him a patient with a gutta-percha filling in the buccal face of a left lower molar. I said to him, "Observe the structure of that tooth and the position of that cavity. Do you see that the filling is good, that it is not much worn, and that it has preserved the tooth?" He said, "Yes, it is good, but it is somewhat cupped and would hardly pass for a permanent filling." I then said to the patient, "Madam, how long has this filling been in?" She said, "I don't remember whether it is twenty or twenty-one years." I then added, "When this filling has been in as much longer I am going to call it permanent." In eight years more that tooth became a little loose and the surrounding tissues irritated; the patient was sixty-five or sixty-eight years old, and in an anemic condition, so it was not thought advisable to tax her system with any further attempt to continue the tooth in position, and it was removed. That tooth is in my collection at our college, and is one of my curiosities. The gutta-percha filling in it has a record of almost thirty years of what any of you would say was good service. The gutta-percha with which that tooth was filled was almost identical with the gutta-percha that I shall present to you to-night. The white gutta-percha shown to-night is a gutta-percha which was suggested by my friend, Dr. Ives, some months ago, who asked me why we could not make a white gutta-percha that would be somewhat tougher than the ordinary. I had abandoned the use of the old white gutta-percha for that of the ordinary base-plate gutta-percha. We next used cream-colored gutta-percha for cream-colored teeth, yellow gutta-percha for yellow teeth, and blue gutta-percha for blue teeth, and have done so almost from time immemorial! So it seems rather strange that I should have come on to-night to speak to you about no new things; and yet I will speak to you of a wide range of things, which although not in the least degree new are still not generally known.

As Dr. Bonwill well said recently when speaking of dentistry and its tremendous breadth, "Dentistry a specialty of medicine! Why, a part of medicine is a trifling specialty of dentistry." And

so it is in all directions in our art, gentlemen. Not one little twentieth of the work we have in hand is known to one in twenty, or one in each two hundred, of the practitioners of dentistry! I appear before you as a *plastic specialist.* The results of my work are none the less beautiful and none the less satisfactory because I use no gold; they are none the less permanent because I use no gold, and they are none the less inexpensive because I use no gold.

My friend, Mr. Joseph Patterson—the same who spoke those thrilling words to your New York bankers in '61—sent me word not six little months ago that I had been one of the greatest comforts to him in his declining years. He came to me at the age of seventy-four, his teeth loose and aching. I used only plastic fillings. He died at the age of eighty-two, and had only lost one tooth in the whole eight years. Some of his teeth I joined by placing platinum bands around them, one strong tooth in the middle holding two loose and shaky teeth, one on either side. It has been said that teeth in this condition had better be extracted. Is it best? And if I do not know when it is best to extract a tooth I ask you who of you does? If the mending of such teeth can be made to give comfort and satisfaction, I say that the proof of the goodness of the work is in its usefulness.

So I appear before you to urge upon you the claims of gutta-percha, and to say that gutta-percha, when properly used, is one of the most permanent of filling-materials. By permanent I wish it to be distinctly understood that I do not mean that in any position, or in any condition and under all possible circumstances, gutta-percha as a filling-material is as persistent or as permanent as is gold, or tin, or amalgam. That is not the sense in which the word permanent should be applied. If a gold filling be introduced into a frail, ill-structured lateral incisor, by the hands of the best worker who ever handled a plugger, and decay comes all around it, and in three little years it drops out into the patient's mouth while masticating,—is that what you call a permanent filling, because everything comes out exactly as you put it in, although the tooth is almost ruined as the result of it? That is not what *I* mean by permanent. If, on the contrary, you take that same tooth and introduce properly a gutta-percha filling, which at the end of those same three years you find much disintegrated and worn away, and you remove the remaining portion of the gutta-percha, finding the cavity of decay practically as you had left it three years before, and then introduce another gutta-percha filling, thus placing the tooth in the same condition that it was before, plus the super-calcification of the dentinal structure,—I ask you which of these fillings, the gold or the gutta-percha, *deserves* to be called the more permanent? And if, still

more than that, you place your gutta-percha, properly prepared, where little or *no wear* can come upon it, in such wise that you know, just as well as you know anything, that a zinc phosphate filling would not have lasted two little years, a gold filling would not have lasted five years, an amalgam filling would not have lasted more than ten years, and that your gutta-percha filling might last fifteen years,—and is there one man here who dares say it would not,—then I ask you if gutta-percha, properly used, is not the most permanent filling-material we possess? We do not say that gutta-percha is the material which, if placed in all sorts of cavities, in all sorts of teeth, will make the best record; neither is gutta-percha the best material when you have anything else that you can rely upon; but in connection with certain cavities of decay, in certain teeth, under certain circumstances, it is the most permanent filling-material that we possess. And it is not *properly* used unless it is used as "the most permanent filling-material we possess."

Now, I will say that I did not need to be urged to come to speak to you upon this subject, because I wanted to place before you the claims of this material, a material which is so trustworthy and so capable of giving satisfactory results to yourselves and your patients. I wanted to try once more to root out the idea that gutta-percha is good enough for temporary work and nothing more. I want to leave with you to-night the impression that you can work gutta-percha precisely the same as you work cohesive gold. It is worth the trial. It is well worth it. When you have a cavity *in which you should employ gutta-percha*, if you take cohesive gold, and with the rubber-dam keep the cavity perfectly dry, placing the gold carefully into it and condensing it there, thus making a piece of work which shall be a monument to your skill as a workman, you can in ten, or eight, or sometimes *five* years, in the vast majority of cases, pass a fine probe between the edges of the filling and the walls of the cavity, and oftentimes you can pass a blunt burnisher between them. You know this as well as I do. Have your gutta-percha tested, so that you know just exactly what it is composed of and the proportions of it. Any man educated in this can test it in ten minutes in his office. Can you? Can you? Can you? When you buy a piece of gutta-percha, can you in ten minutes test it and tell just the proportions of organic and inorganic matter, its heat-grade and tenacity, and just how it is going to wear? I think you may safely say no. And yet you all ought to do it. You handle your gold, you roll your gold, and you test your gold, and then from that manipulation you say you don't like that gold: it works brashy, it does not adhere, it is not sticky, it does not pack as you want it, therefore it is not good. Do you know when gutta-percha packs

well? When it makes you feel just as you do when you have made an elegant gold filling.

When I have made gutta-percha fillings in this wise I feel, as I have said, as though I had done something, and not that it is simply a temporary piece of work. I do not expect when a patient returns to me in three, or four, or five years to be able to run a probe round the margins and lift the filling out of the cavity; I expect that filling will be almost or perfectly intact.

You know very well that I never make these assertions unless I have it in black and white on paper to show. I am altogether too careful for that. There are fillings made of Hill's stopping thirty years ago that are now in existence. I heard about a month ago of a patient who had a gutta-percha filling that Dr. Hill had introduced for him thirty years ago. And yet so meager is our information that the last book on dental chemistry, published by Dr. Mitchell, of Chicago,—and it has received the indorsement of almost every dental faculty in this country,—states that Hill's stopping was made of gutta-percha, quicklime, and silex. We have known positively for a quarter of a century that Hill's stopping was *not* made of quicklime and silex; but we do not know what it was made of. So difficult is its analysis that we have not been able to say positively what Dr. Hill made his stopping of. And yet the last published book on dental chemistry states the same old story that was exploded twenty-five years ago.

They were told at the "First District" a year ago that the manner in which gutta-percha was made was to heat a piece of iron casting about the size of a raisin-box, upon which thin sheets of gutta-percha the size of that piece of iron should be placed, oxide of zinc being spread on the gutta-percha and rolled in with a roller. In order to prevent the material from sticking to the roller, a towel was to be placed between the roller and the gutta-percha. If I had my choice between seeing that performance or the best negro minstrel show that I have ever seen, I would choose the gutta-percha performance! So *I* say that a good gutta-percha stopping cannot be made in that way!

I have here a diagram illustrating the correct process. I would say in the first place that there is but one article that I have ever found that makes a good gutta-percha filling-material. I have two samples: one is a dark-colored material and the other is a little lighter colored; both pieces came from the same sheet, but they are tested by bending, thus. [Several members tested them.] The dark-colored gutta-percha is used for "high heat," and the lighter colored for "low heat," gutta-percha stopping.

When the gentleman read that paper on gutta-percha, Patriarch

Atkinson is reported as having said that it showed great attention had been given to the subject. The fact is it did not show that any had been given. Patriarch Atkinson thought he knew about it. He did not know anything about it. He said that gutta-percha had been presented not as a permanent filling-material, but as a crutch to help us over difficult places, and as such he indorsed it. I do not want it to be welcomed on any such terms as that. I do not want this material to be looked upon as a crutch. I wish it to be recognized as a reliable friend in need! I bring these samples to you to show you all the various steps in the manipulation of what I shall tell you of, so that you can follow it out for yourselves. I wrote to the gentleman who read that paper and told him that the statements in his paper were so strange that I almost doubted them, and I said I wished he would send me a sample of gutta-percha made after his fashion, in order that I might test it and see if good gutta-percha could be made in that way. He replied that if I doubted his assertion I would doubt his sample. Now, I don't reply in that way when I am asked a question. I am ready to substantiate my assertions at all times: my laboratory is open to all who wish to examine and test my work and see the things that I make. And that is the reason I am here: I want you to *know* something about this, and see what has been done and what can be done, and take for yourselves a "new departure" in this direction. My friend Bonwill said the other night that "owing to the 'cold wave' that had been given to the New Departure," etc. What cold wave? All things, ever since our slogan was sounded, have taken each its "new departure." Even this day, in the morning paper, we see that owing to the withdrawal of Mr. Blaine, the Republican party is going to make a "new departure." Is this popular universal adaptation of our name indicative of a cold wave in THE "New Departure?"

Now, this material is called gutta-percha; it is obtained at Bishop's factory, within fifteen minutes or so from here. It is pure Para gum,—as pure and nice as can be obtained for the purpose of manufacturing. The second grade is this Para gum mixed half and half with a brown gum; this is called gutta-percha II. It is an inferior grade. The third grade is a light gutta-percha that is made of one-half of this good gum and the other part is a good-for-nothing, soft, crumbly, white, miserable stuff that makes a good-for-nothing article for our purposes. If you wish to make a good gutta-percha of a light color, it is necessary to mix with it oxide of zinc or sulphide of zinc, sulphite of lime, and various other materials. It is generally very largely pure oxide of zinc and nothing else, which makes an excellent material. You all know that sulphite of lime is recognized as one of the most reliable antiseptics, and consequently

a little of it is added for that purpose. What makes our red gutta-percha so hard and tough? Is it the sulphide of mercury? Can anybody say what it is? I wish they could. We have nothing in the red gutta-percha but the sulphide of mercury and oxide of zinc. That makes very nice material; but it is red; you cannot put it, acceptably, in front teeth. Besides that it is "low heat;" it bulges in the mouth, or "time rots," as it is called, and wears out faster than this gutta-percha. So we mix with it a larger quantity of oxide of zinc and sulphide of zinc to make it hard.

The only way for you to use gutta-percha successfully is to "test" the various materials before putting them into the mouth. The testing of the *value* of the various inorganics is the work of a lifetime. I never expect to see the sulphides determined in connection with gutta-percha.

We have then this red Para gum as a material to start with. Again there is this curious thing of which I have spoken,—a thing which Mr. Bishop's men are unable to explain. From the same roll or sheet of gutta-percha you will get two or three different kinds or grades; one kind will be best for high-heat gutta-percha, another kind will be best for low-heat gutta-percha, and the third kind we will have to throw away as refuse. I wish you would take this piece and bend it and see how springy it is. Now, take this piece, that is stiffer, although it is smaller. They were both taken out of the same roll. This is only about two-thirds as big and two-thirds as wide as the other, yet it is stiffer. That shows that every piece of gutta-percha that is made into filling-material must be tested first by bending and then afterwards by putting it to a heat test.

If you want to keep gutta-percha good you must put it into salt water and keep it there. I have now good gutta-percha that is eighteen years old. I made an experiment four months ago for the purpose of testing it before the class; I took some of this eighteen-year-old gutta-percha that I kept in salt water and tested it, and it answered every test as well as the new gutta-percha which I had just obtained from Bishop's. You need not be afraid of gutta-percha stopping spoiling if "good" when bought. But gutta-percha in this shape, left to dry in the open air, becomes nearly worthless in the course of a year or two.

I have brought two samples of gutta-percha to show you to-night. One, the yellow, was made eight years ago; the other is white and was made a few days ago. If you want a tough and tenacious material you must have a machine something like the one shown in this diagram. All these machines are heated with a combination of dry and wet heat, gasoline being the fuel used. There is a large cylindrical vessel of water, upon the cover of which is a

nickel-plated slab. The gutta-percha is placed on this slab, and is worked over by hand with a wedge-shaped lug attached to a strong rod arranged as a lever. It is the *only* way, so far as I know, in which it can be done properly. Rolling does it, but not as well. It does not make it as tough. It has to be worked by hand, and requires great delicacy of manipulation and great strength. The gutta-percha being placed upon the slab, the handle is taken, and the powder added by kneading. Oxide of zinc, sulphide of zinc, oxide of magnesia, sulphite of lime, and aluminum are among the best of the "inorganics." It is worked on for six or eight hours, and then is "toughened" by one or two hours more of kneading, provided you are going to make five or six ounces of gutta-percha stopping, which is a good day's work. It is dreadfully hard and tiresome work. You see how beautiful the gutta-percha is when it is in a finished condition [showing sample]. It is almost as hard as a stone. It is then passed between rollers for the purpose of preparing the mass for ordinary use. Those rollers must be nickel-plated. We have to nickel-plate all the appliances which we use in working gutta-percha. It does not take so much kneading to make the white gutta-percha as it does the colored, and as the white is the best, I accepted the suggestion of my friend, Dr. Ives, that we should go back to white gutta-percha. It is passed through the rollers and then cut up into little pieces and stamped "High Heat" or "Low Heat."

Now, gentlemen, you see why I told you in the beginning that I was not going to tell you anything that was new, but things that were not generally known; that is all.

The colored gutta-perchas are all medium heats. The white gutta-percha must be marked high or low, as the case may be.

I have brought all the appliances and instruments for introducing a filling to-night, and I will try to do that. But I will say in this connection that gutta-percha is a leaky filling-material. No gutta-percha filling that ever was made is a tight filling so far as I know; and I have brought you all the various tests to show you. For these tests the gutta-percha is packed into a glass tube as hot as it can be borne in the hand, so as to expand the glass tube as much as possible; then it is placed in another bottle so that the atmospheric changes cannot affect the experiment. No gutta-percha filling can ever be placed in the mouth under such favorable circumstances. Examination of these bottles will show you that they all contain leaky gutta-percha fillings. It took just one and a quarter minutes for one of them to leak. Here is one of red gutta-percha, which you see is a great deal more leaky than the other. The reason is that it has only three parts of inorganics. The red gutta-percha

base-plate is the most leaky gutta-percha that we have. No filling in a tooth can be made with it that will not leak badly in less than five minutes. But gutta-percha is no less an "excellent" filling-material because it is the lowest in the scale of conductivity, and the lowest in the scale of irritability.

Amalgam permits moisture to do good! We recognize that fact, and therefore it is that amalgams that do not shrink are not as good tooth-savers as amalgams which shrink. The shrinkage of many amalgams nowadays is very slight. Some of the amalgams shrink and some do not. Some of the new amalgams wear better than the old. In five minutes you can tell whether an amalgam will shrink or not. In thirty minutes you can ascertain the composition of your amalgam. You may remember the evening that a few of us once spent in Dr. Lord's office, when we tried there a number of samples of amalgams, testing them for "quality," and there were only three out of all that lot which proved to be "good." We know that all "submarine" amalgams leak; we know that all the "contour" amalgams leak, and we know how much they shrink. A filling an *inch* in diameter shrinks just one-four-thousandth of an inch. We know that all do not shrink. All of the white amalgams that have from three to five or ten per cent. of zinc in them, when you come to make a filling *one and one-half* inches in diameter, do not shrink a particle. We know they do not shrink, but they do not save teeth. They will save teeth in certain degree, but not as well as a leaky amalgam. We know these white front-teeth alloys will not save teeth as well as the dark-colored amalgams will. Fifty per cent. silver, twenty per cent. gold, twenty per cent. tin, and ten per cent. zinc make a good "front tooth" alloy.

One of these little test-bottles reminds me of a very humorous incident that occurred in my office some years ago. One of my friends in Philadelphia looked on with a most peculiar expression of countenance at my work, and he said, "Do you know how to stop leakage?" I said, "No." He said, "If you just dissolve your gutta-percha in chloroform and paint all around the wall of the cavity, and then place the filling inside of that, you will have a perfectly water-tight plug." I said, "That is a good idea; I will try it." And we got some chloroform and dissolved some gutta-percha, and he painted around the inside of the bottle and then filled in his material, then poured in some purple ink, and it went straight down to the bottom! There was a great and very funny change in the gentleman's expression.

Here is a sample bottle marked "Oliver." Said he to me, "I want you to give me a certificate in regard to my gutta-percha; I have a material that will not leak. It is absolutely water-tight." I said,

"That is a grand thing. Here is a bottle; we will pack some of your gutta-percha into it, and try it." We did; we made this filling, and he and I both said it was an excellently-made gutta-percha filling. We then put in the purple ink, and in about five minutes we had the result that you see: it is streaked all over. I said to Mr. Oliver, "My friend, you can go on advertising that your filling-material does not leak as long as you choose, but there are two gentlemen in this world who know better; one is you, the other is I." It was said, when this matter was brought up, that these glass tubes did not prove anything, because a gutta-percha filling in a tooth is not like gutta-percha in a glass tube. I was prepared for that, and produced two little ivory cups; and you cannot get anything much more like tooth-substance than ivory. The ivory cups were used for the experiment, and we filled one with white gutta-percha; the ink was poured in, the end of the cup was sawed out, and it was found to have leaked. Then we filled a cup with red gutta-percha, and it leaked a great deal worse than the other. There is no answering that. Gutta-percha leaks just the same in ivory as in glass, only you cannot see it as well! [Showed the ivory cups.]

You all know that extraordinary work, "The American System of Dentistry." It is one of the most peculiar works extant. Its chief peculiarity is that you never know whether there is any truth in what you are reading or not. There is in that work an article on "Plastics," which is so defective in what it says and in what it omits to say that it should never have been printed; it is an incontrovertible demonstration of ignorance of the subject written upon. I think, on the other hand, that you will recognize such an article as Dr. Bonwill's on the "Geometric Relations of the Jaw," as being of a very different order. Take that and see what food there is in it for study. It is simply immense. That such an article as that and such an article as the one I have referred to should be published in the same book is abominable. In the article on "Plastics," the gutta-percha part is most *fitly* illustrated with an instrument that has been obsolete for years. It is one of the old diagrams of a warmer that I made ten years ago. That old, obsolete gutta-percha warmer answered very well in its day, but now we have a gutta-percha warmer which has been in use for about four or five years that is far superior. Here is one of the new warmers, the first one of which was made at a cost of hundreds of dollars. The modifications were all made after the models which I had previously given the manufacturers, and it will fit the old framework, so that those who have the old gutta-percha warmer can, at an additional expense of only seventy-five cents, be furnished with all the new parts. This is *why* I so arranged it.

The heating of gutta-percha is all governed by your instruments. When the instrument handles are not warm the gutta-percha will not be soft enough, and when the instruments are just warm enough to work with nicely, the gutta-percha is just right. No matter how carefully gutta-percha is made, if you put that gutta-percha into the naked flame of a spirit lamp there will be an undue amount of heat for the outside of the gutta-percha and an insufficient amount in the center. We see the necessity, therefore, for a gutta-percha warmer upon which to heat gutta-percha. If it is high-heat gutta-percha it must be packed with a warm instrument, and it is much better to have the gutta-percha and the instruments all uniformly warmed and ready to take up, so that piece after piece can be properly packed. Such a gutta-percha warmer is a great saver of time and trouble, and I do not think I could dentally "keep house" without it. By placing the gutta-percha upon the slab you soon get the warmth required, and with a small probe you take up piece by piece and pack them into the cavity and work them into homogeneity with the warm instruments,—not with an idea that gutta-percha is good enough for a temporary filling, because with that idea you will not accomplish anything. Suppose you have prepared a cavity for making a gold filling, would you do the elegant work that you do if you proceeded with the idea that it was to be only a temporary filling? On the contrary, as you place piece after piece in the cavity, you are well satisfied, and have reason to say to yourself that it is a grand, good filling, and will save the tooth and the pulp. Do you suppose if we put our gutta-percha fillings in in that way that they would be quite as temporary as some of them now are?

The instruments used are all of familiar shapes. They may be such shapes as we use for gold work, all serrated on the points. Certain ones are straight, others are the corkscrew-shaped instruments, rights and lefts; in fact, I can say nothing that comes nearer to the truth than that you should introduce gutta-percha exactly as you would introduce the pellets or pieces of cohesive foil, with the exception that gutta-percha does not require retaining pits. You require some little retaining points, but they are trifling. Gutta-percha adheres in a measure to the walls of the cavity. It shrinks enough to leak, and because it does we denounce it as a front-tooth filling, unless the tooth is "lined" or varnished with some other material.

Dr. Northrop. How do you finish the fillings?

Dr. Flagg. I am glad the question is asked. We use precisely the same instruments that we used in the days of Wood, when he had his fusible metal. His instruments were thin at the head and had a large solid base. These instruments when heated retain the

heat for some time, and we cut off the superfluous material with them. You should have very little superfluous material in connection with an ordinary gutta-percha filling.

Dr. Watkins. Which do you consider the better tooth-saver, high-heat or low-heat gutta-percha? And do you consider the varnishing of cavities a great benefit?

Dr. Flagg. I don't think there is any difference between the saving qualities of high-heat and low-heat gutta-percha. The wearing is different. High-heat gutta-percha will outwear low-heat gutta-percha almost two to one. In filling soft and badly-decayed teeth you want a low-heat gutta-percha first, in order to work closely to the pulp. I think good varnishing retards decay, but I here speak of it entirely with relation to discoloration, or "clouding," as it is termed. In placing gutta-percha in front teeth, which we did years ago more than we do now, we always varnished or lined the cavity with oxychloride of zinc if it was a vital tooth, or with zinc phosphate if it was a pulpless tooth. If anything can save the pulps in vital frail front teeth, gutta-percha will do it. If there is any filling in the world that will permit the continued life of the pulp in a soft tooth with the pulp almost exposed, it is gutta-percha. But if in spite of this the pulp dies—and with the best of gutta-percha work pulps do die—and the patient comes complaining of a tenderness about the tooth, and pulpitis is finally developed, you have a filling easy to remove and but a very little distance to go to get into the pulp-cavity and relieve the trouble.

There is leakage around a gutta-percha filling, and yet you can prevent the clouding of the tooth by varnishing the cavity before filling, and for that purpose I think the varnish suggested by my friend, Dr. Ives, is the best. It is made of virgin rubber, 30 grains, in half an ounce of chloroform; gum damar and gum sandarac, each 20 grains, in half an ounce of chloroform; dissolve and make an ounce. It makes a very strong, solid, and somewhat opaque varnish.

Dr. E. T. Payne. The shrinkage of a gutta-percha filling necessarily admits more or less moisture to the cavity; and when moisture is so admitted how do you account for the fact that disintegration of the tooth-substance does not ensue the same as it would if a gold filling leaked?

Dr. Flagg. From the fact of the gutta-percha being an absolute non-conductor, the lowest material that we have in the tension scale of galvanic and electric action, and that therefore the chemical and concomitant action which takes place between the gutta-percha and the tooth-bone is restrained rather than permitted through the favoring influence of conduction. The only action that

can take place results from the leakage of moisture, and it is not a great leakage, only enough to cloud the tooth. In that connection I think you will have to depend entirely upon Miller's bacteria to carry on the decay!

Dr. Perry. Do you use matrices?

Dr. Flagg. I never use them *for gutta-percha.*

Dr. Perry. One of the most valuable uses that matrices can be put to, in my judgment, is in filling with gutta-percha.

Dr. Flagg. Gutta-percha is not presented as a material suitable for all sorts of cavities, but only those having circumscribed walls,—comparatively round, shot-hole cavities in the buccal, distal, and mesial surfaces of teeth, not on the articulating surfaces; where the cavity is small on the outside and large on the inside, and where the tooth is soft, of frail structure and highly organic,—such cavities as would be prepared for gold fillings by cutting away all the surrounding enamel-walls until you get to strong walls,—in filling such cavities with gutta-percha you conserve the enamel-structure all that you possibly can. If the enamel-walls are so thin and frail that you fear their breaking away, then I would line them with either oxychloride of zinc or zinc phosphate. Vital teeth I never fill with zinc phosphate without full pulp protection. Fill them with nitro-phosphate if you want strength. When it is done then you finish up your cavity with a chiseled or burred edge, and you have no feather-edge to cut down to.

I want to induce you to try these things, for certainly you must understand that from such stand-points as I offer here to-night you *know* little about plastic fillings. You may have been told that my practice is among the rag-tag and bob-tail of Philadelphia, but many know well that my patients are from among the very best, the most intelligent, and most wealthy of the people of that city, and are typical individuals of their class; and yet they are perfectly satisfied with the work I do for them. Would they be satisfied if it was not good work?

Dr. Perry. I think you have said nothing in regard to the expansive qualities of gutta-percha.

Dr. Flagg. It never expands; it bulges, and is beaten out by occlusion.

Dr. Perry. Sufficient to break the walls of frail teeth?

Dr. Flagg. Gutta-percha in some cases "rots," and as it rots it grows spongy and takes in the fluids of the mouth. It breaks a tooth by being pounded upon. When a gutta-percha filling is so exposed that you bite down upon it, it is beaten down by occlusion, and if the walls of the tooth give way it is not by true expansion, but simply by pounding upon the gutta-percha. It is very neces-

sary that the end of the packing instrument should not come in contact with the flame of the lamp. If it does, the touch of the instrument smirches the gutta-percha. The instruments must either be wiped off, or, better still, have the gutta-percha warmer so arranged that the blaze does not touch the points.

Dr. Perry. Is that gutta-percha on the market?

Dr. Flagg. Yes; and were it not for a certain fact I should stand before you in a very invidious position. I am a manufacturer of filling-materials, and became so because I wished to be able to supply those gentlemen who desired such as I used myself, and that I might impart practical instruction in the making of plastics. The doors of my laboratory are always open to all, and I try to instruct so that all can make all these materials themselves. Scarcely a "boy" goes out of our school who has not made one or more ounces of the various sorts of materials. I take these plastic materials to the school and show them every part of the process of their preparation; and then the "boys" come up to my house in squads and I take them into the laboratory and show them how to make all the plastics for themselves.

Dr. Watkins. What is this gutta-percha known as?

Dr. Flagg. I suppose it is known as Flagg's gutta-percha. If I were a manufacturer strictly as such, I could not come here and tell you that certain things I made were superior to all others. You know very well I could not do such a thing as that. It makes but little difference to me, pecuniarily, whether I sell one ounce or a hundred ounces of gutta-percha stopping. But I learn how to teach "plastics," and that to me is much.

Dr. Payne. You commenced using gutta-percha stopping a long time ago,—thirty years ago?

Dr. Flagg. No, not thirty years ago; but it first came out before that time.

Dr. Perry. Was it not better than this?

Dr. Flagg. I don't know; we have not found that the incorporation of hydraulic cements makes the fillings wear any better than they did without them. On the contrary, we found a grit in the finest of the hydraulic cements that seemed to make the fillings rather roughish.

Dr. Payne. You know that when we commenced to use Bevan's stopping it was a very excellent filling-material, but before it went out of the market it became very inferior?

Dr. Flagg. Yes.

Dr. Payne. Hill's stopping was used thirty years ago, and you know that to-day it is not as good as it was when it was introduced. How do you account for that?

Dr. Flagg. By the fact that the name is given to a material that is not Hill's stopping at all.

Dr. Payne. I account for it by the fact that the first invoice of gutta-percha that came to this country was of a very different and superior quality from what it was after ten or twelve years; and Hill's stopping from 1855 to 1867 gained a good reputation, and justly, because it was at first made from this superior raw material. Dr. Bevans did the same thing before that good material went out of the market. It has gone out of the market, and that accounts for the difference between the gutta-percha stopping of years ago and the gutta-percha stopping of to-day.

Dr. Flagg. I think that is very probable. In those days the trees were cut down to get the gutta-percha, while now they are only tapped and the gum drawn from them. Gutta-percha that comes to us now is not as strong and tenacious as it was in those days; and for that reason we thought at one time that probably the incorporation of the light-colored hydraulics would make gutta-percha strong if nothing more.

Dr. Payne. I know what Dr. Hill incorporated into his gutta-percha stopping, as I was a student in his office at that time, and if you used any gutta-percha twenty-five years ago you used that which I made.

Dr. Flagg. What did you incorporate into it?

Dr. Payne. Oxide of zinc.

Dr. Flagg. How did he make it?

Dr. Payne. He made it with hand-pressure and dry heat, using two hard-wood kneading sticks. In that way, if you have the same material, and use oxide of zinc with a strong arm, you can make as good gutta-percha as he did.

A voice. Is there any difference between the India gutta-percha and the Para gutta-percha of South America?

Dr. Flagg. I am entirely unable to answer that. One of my friends once sent me some of the finest gutta-percha that could be bought in Germany. I sent him back word that when I tested it I found it to be the poorest gutta-percha that I had ever used. It was utterly worthless. When I take two samples of gum and find that one is good and one is good for nothing, I cannot tell whether the good gum comes from India or Para.

And now, my friends, in conclusion allow me to thank you cordially for your kind and prolonged attention; to disclaim any original intention upon my part of doing anything more than starting an evening's discussion instead of occupying an evening's time, but to sincerely hope that as you have so patiently listened to the subject-matter which I have brought you, my effort may be productive of

thought, of experiment, of satisfaction, and of tooth-salvation; and that it may bind even more closely, if possible, the exceeding kind relations which have, for so many years, existed between us. I bid you good-night.

Dr. Dwinelle. Probably there is no material that is so variable in its qualities and characteristics as gutta-percha. Unfortunately for me, I was engaged in the gutta-percha business for a number of years, and I gained a great deal of valuable information in regard to the material. I found that there was a bastard gutta-percha which, when placed in the teeth, would after a short time lose its fibrous character and crystallize into something as near like resin as anything. I found also that there was a variety of gutta-percha that would endure to the end; and I think I have some of it in my office now. I think, as do the previous speakers, that the original gutta-percha that we found to be such excellent stopping was made of that better quality of gutta-percha. I am sure that nothing in my experience is equal to the gutta-percha stopping made by Bevans, especially the first lots. I filled some teeth with it for a patient, and it remained for fifteen or twenty years.

On motion of Dr. Perry, a vote of thanks was given to Prof. Flagg for his able address.

Adjourned. S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

ANNIVERSARY MEETING, FIRST DISTRICT DENTAL SOCIETY.

At the evening session of the nineteenth anniversary meeting of the First District Dental Society of the State of New York, January 16, 1888, the following report, by Carl Heitzmann, M.D., and C. F. W. Bödecker, D.D.S., M.D.S., was read:

Microscopical Examination of an Implanted Tooth, extracted from the Mouth of Dr. Wm. J. Younger.

Immediately after the removal of the tooth at the clinic of the First District Dental Society in October, 1887, it was placed in dilute alcohol by Dr. Wm. H. Atkinson, who brought it to the laboratory. The alcohol was replaced by a solution of chromic acid of the strength of about one per cent. This solution was renewed every fourth or fifth day, which process removed the lime-salts from the root of the tooth, thereby rendering it soft. The crown was removed from the root, the latter imbedded in celloidine and cut in the usual way. While the chromic acid solution was acting upon the tooth, a large number of shreds or plates became detached from the

root which freely floated in the liquid. These shreds upon microscopical examination proved to be masses of micrococci, bacteria, and leptothrix. As to the origin of these micro-organisms, we can only suggest that they found access to the root of the tooth through the incomplete attachment of the gum, and the newly-formed socket of the root of the implanted tooth, at least at one portion of the root, to which circumstance is also attributable the looseness of the tooth during its presence in Dr. Younger's mouth.

Two sets of sections were made from opposite portions of the root, and these proved to be so different in their aspect that the writers propose to consider them separately.

In the first set of sections the cementum was intact, and its border toward the dentine well defined, while its periphery appeared slightly jagged, as if broken up into small pieces, and thus crevices had formed. Around the outer periphery of the cementum either globular or granular and nucleated corpuscles were present, or a protoplasmic mass, apparently continuous with granules, the nuclei of which were not distinctly marked. Entangled with this mass, which penetrated the crevices in the surface of the cementum, were observed a varying number of red blood-corpuscles. There was no trace of the original pericementum, but in some places the writers noticed delicate and finely granular bundles of connective tissue, obviously newly formed from the protoplasm around the cementum, which entered even the crevices on the surface of the cementum.

In most instances the cementum appeared sharply defined, owing to its high refraction, in contradistinction to the surrounding protoplasm. In some places, however, such a distinction was rendered difficult, or even impossible, owing to the fact that the cementum had been deprived of its lime-salts, and assumed a granular appearance very much the same as the surrounding protoplasm.

The second set of specimens was widely different from those above described. In these only scanty traces of cementum were observable, exhibiting bay-like excavations identical to those we observe in the process of pericementitis and cementitis. In most places the dentine was exposed without showing the least change in the dentinal canaliculi, in some of which even the dentinal fibers were traceable, appearing irregularly granular and shriveled. The dentine was corroded and pierced by innumerable bay-like excavations, in appearance exactly like the root of a temporary tooth during the process of shedding. The bays were filled either with finely granular protoplasm, with medullary corpuscles, or with multinuclear protoplasmic bodies known as giant-cells. In places where the dentine was absorbed to a high degree, the surface likewise exhibited a number of giant-cells and medullary corpuscles. In some places

bundles of a delicate fibrous connective tissue were observed, apparently newly formed, entering the bays of the dentine, and being torn at their distal ends by the extraction of the tooth. In one place even a small piece of bone-tissue was seen, holding two bone-corpuscles. This bone-tissue appeared identical to that which we observe during the process of absorption of the temporary teeth, and which arises in place of previous dentine. The fibrous connective tissue formed bundles along the dentine, being made up of delicate spindles, and within it we noticed newly formed capillary blood-vessels, terminating in a pointed way toward the bays of the dentine, and partly filled with red blood-corpuscles.

If we consider this implanted tooth from an histological as well as a practical point of view, we will notice several points of interest.

Since Ziegler, in 1874, demonstrated that between two thin glass covers brought under the skin of a rabbit, migrating corpuscles will accumulate between these plates, and from which the so-called giant-cells arise, one of the ways of the formation of multinuclear bodies has been cleared up. The question, however, whether from such migrating corpuscles by their coalescence, fibrous connective tissue may arise, remained unsettled. This question seems to deserve a positive answer from the study of the first set of specimens before alluded to, in which delicate fibrous connective-tissue bundles were seen to enter even the small crevices on the periphery of the cementum, although the cementum was surrounded by a great quantity of migrating corpuscles, which, however, were not in direct contact with the surrounding tissues.

In the second set of sections, granulation-tissue had penetrated into the cementum and the dentine of the implanted tooth, which tissue had arisen from the artificial alveolus (the bore-hole in the living bone-tissue of the jaw). This granulation-tissue is supplied with blood-vessels and enters the bays on the surface of the root of the implanted tooth, and thus accomplishes an attachment which sufficiently explains the firmness of implanted teeth.

The writers emphatically deny that in this implanted tooth a living union had taken place between the granulation-tissue of the jaw on one side and the cement and dentine of the implanted tooth on the other side. We also state that a revivification of the once dead tissues of the implanted tooth had not occurred, since the writers observed nothing in the above-mentioned specimens to grant such an assumption.

The firmness with which the implanted tooth is held in its artificial socket is explicable upon the fact that the granulation-tissue found its way into the bays which were formed by the melting out of the dead cementum and dentine.

From a practical point of view the formation of the granulation-tissue around the root of an implanted tooth seems to grant far better results in the operation of implantation than in either replantation or transplantation, where most of the pericementum is destroyed by previous suppuration, chronic inflammation, or by the handling of the tooth during the time it is out of the mouth, whereby the pericementum becomes unfit for an active new growth. In implantation, on the contrary, a perfectly healthy tissue is formed around the root of the implanted tooth, which is assisted by the acute inflammatory process arising from the drilling of the artificial alveolus. Although the writers consider the attachment of an implanted tooth merely mechanical, yet it is accomplished by a very active and freely vascularized and newly-formed tissue, which sends innumerable outgrowths into the bays of the cementum and the dentine, and which in this manner produces a firm attachment of the foreign body which the writers consider an implanted tooth to be. Still, the chances of success in implantation are better than either those of replantation or transplantation. How long such an attachment of an implanted tooth will last, only experience can prove.

Dr. Carl Heitzmann. Mr. President and Gentlemen: You have heard the report upon a subject which I am convinced is of the utmost practical importance to you. Dr. Younger has made a discovery which I am now convinced has a good future. Even if it does not do away with artificial dentures, as Dr. Younger hopes, it will revolutionize your practice to some extent.

When Dr. Younger first appeared before your profession here in New York, at a meeting of the Odontological Society, and reported upon his operations, showing at the same time two cases of successful implantation, I was present myself, and that implantation is followed by success I could not doubt from what I then saw. A lady was present who was kind enough to demonstrate to us the success of the operation of implantation in her mouth. That tooth was inspected by a number of gentlemen; and Dr. Atkinson afterwards told me that in a sly way he managed to introduce the thin blade of a penknife between the gum and the implanted tooth, and he saw a drop of blood oozing forth.

Dr. Younger at that time took a theoretical ground which I had to oppose. His hypothesis was, and I believe is still, that the implanted tooth is revitalized or revivified. That I could not admit. I compared the whole procedure with the driving of a foreign body into living tissues. We know that before projectiles had reached their present state of deadly perfection, when bullets were made

globular, in the first Napoleon's wars there were a great many instances in which such leaden balls were driven into the living tissues, into the bones even, of soldiers, and that such leaden balls lodged in the tissues were carried for years without the least reaction, and sometimes without their knowledge, their presence being only discovered by post-mortem examination. Now I said that admitting that a foreign body, like a leaden bullet, can be fixed in the living tissues in such a way that it is firmly attached and remains there, have we any right to say that such bullet has been vitalized and made alive by the process of implantation ?—very much of course against the will of the soldier. Nobody would maintain any such thing as that. I took the ground that very likely the attachment of the tooth in the socket was merely a mechanical one, with perhaps some growth around the root that held it fast in the newly-formed socket. I had the pleasure afterwards of repeatedly seeing Dr. Younger in my laboratory, and I urged him to make experiments upon dogs or cats,—to implant teeth in their jaws, leave them there for a number of months, and then send to us from San Francisco the jaw containing the implanted teeth, and we would make careful examinations and report. Dr. Younger is, of course, a busy man, and had no time or opportunity to make such experiments. But when I met him last September in the house of Dr. Bödecker at a dinner given in honor of Prof. Busch, of Berlin, I again expressed a wish to examine an implanted tooth under the microscope, and he then said, "I will give you my own tooth ; I have carried an implanted upper bicuspid in my mouth for about six months and I am willing to sacrifice that tooth to science ; particularly because it is a little loose and of not much value to me." We accepted his generous offer. Dr. Younger was so positive of its success that he laughingly said, "You microscopists don't care much for what you see ; you will surely say it is a failure ; and I will admit then that it is theoretically a failure ; but admitting that, it is nevertheless practically a success, for if you can make an implanted tooth remain and do fair service for three, four, or six years, and then it drops out of the mouth, you can bore a new hole and replant another tooth, and then you are all right for four or five years again." It was perfectly sound and legitimate reasoning, we will admit. Of course I was only anxious to see the operation an absolute success. That it was to a certain extent successful was then evident. After that time Dr. Weld gave us his experience of transplanting and replanting in some seventy odd cases, and while at first he thought the operation was going to revolutionize dental work, it resulted that all his cases, without a single exception, proved to be failures. That was a hint to us, of course.

In the case of Dr. Younger, which has been reported upon, the tooth was taken out with the utmost care, placed in alcohol and brought to my laboratory and treated in the usual way. Then we began to make sections in the manner Dr. Bödecker has described. One thing that struck me very forcibly was the presence on the specimens of a large number of specks which, upon examination under the microscope, proved to be micro-organisms of various kinds: micrococci, bacteria, leptothrix, etc.,—creatures which are supposed to do great mischief in the mouth. It was certainly surprising to see these micro-organisms in such numbers upon the root of a tooth which had been implanted six months previous, and which had been subjected to a strong solution of corrosive sublimate. The question arose whether these micro-organisms had penetrated down to the newly-formed pouch; and if that was so it would prove there was no attachment whatever. It was a strange coincidence that the first sections made from the tooth apparently corroborated this view.

The surface of the cementum looked jagged, and was filled with crevices, lined by comparatively small globular corpuscles, as we know exist in the basis-substance of the cementum generally; and there were bays within the cementum, containing something like cement-corpuscles. There was the dentine, in which were the same granular crevices containing fibers, and we saw around the cementum nothing but a mass of micrococci, bacteria, leptothrix, clusters of leucocytes, with here and there pieces of protoplasmic bodies; even the coalescence of such medullary corpuscles, or giant-cells; and here and there we saw bundles of fibers, looking something like newly-formed connective tissue, penetrating the crevices, and thus establishing some slight connection between the tooth and its surroundings.

That was an extremely poor result, and the gentlemen who saw these specimens in my laboratory smiled at it. But we did not stop there.

A few hours before Dr. Younger left New York for his home in San Francisco, last September, he came to my house and said, "Doctor, I just came to ask you to please be careful and do your utmost in the line of accuracy in examining this tooth." I said to Dr. Younger, "I am happy to see you in my house, but if you knew me better than you do you would not have come for that purpose. I am not infallible, neither are the gentlemen who work in my laboratory; I am not a pope, and am the last person to claim absolute trustworthiness for the results obtained; but what we do in my laboratory we do with the utmost care and to the best of our knowledge, and as regards the reliability of our statements you need not be worried."

I recollected that conversation, and I thought I would give Dr. Younger another chance. I said, "Let us examine another portion of the root." We did examine other sections, and there we found conditions which will explain the way in which implanted teeth are fixed in their sockets, as described by Dr. Bödecker.

The cementum on one side of the root of this tooth was almost gone. You know that Dr. Younger laid great stress upon the importance of the presence of a little bit of dried film of pericementum on the root of the extracted tooth, claiming that a tooth carrying such a little bit of dried film of pericementum is better adapted for implantation than one which is perfectly bare. And he may be right about that. That is a practical point. I remember that I said at that time it might be something like sponge-grafting; that the dry pericementum would represent the sponge in which the corpuscles would grow and form tissue sooner than they would without it.

But on this root when we examined it there was no trace of dry pericementum; and there was very little of the cementum left. Along the surface of the root there were numerous bay-like excavations, similar to those seen in the root of a deciduous tooth in the process of shedding. An oblique section showed canaliculi with shriveled dentinal fibers in them. In those bays there were a number of features worthy of attention. There we saw medullary corpuscles, and the so-called giant-cells, bodies which are supposed to originate from the coalescence of a number of medullary corpuscles; and there we saw granulation-tissue, myxomatous and fibrous connective tissue penetrating the bays, which was supplied with a certain number of newly-formed blood-vessels. As soon as we saw that, we of course had to change our opinion. This explains the fact that Dr. Atkinson had been able to make the gum, or the tissue between the gum and the pericementum, bleed; because these newly-formed blood-vessels really had penetrated the bays. We found here an explanation of the fact that such an implanted tooth may be firmly fixed in its newly-formed socket; that is, that the granulation-tissue had grown into the bays, and these bays being rather deep and irregular, there was of course a good chance for the granulation-tissue and the fibrous connective tissue to grow into them. The whole face of the dentine itself was much melted down.

Now, gentlemen, the tooth that we have examined was by no means a favorable one for the purpose of Dr. Younger. One side of the root was entirely worthless to him, and to us too. We can see that if the process that I have just described, the formation of bays in the dentine and the penetrating of the granulation and the fibrous connective tissue into those bays, goes on all around the

root, we have really a good explanation of why such a tooth is held firmly in its new socket for a number of years. And then comes the question, Is this process stable? Is the formation of the bays and their occupation by this new tissue permanent? Or does it go on in exactly the same way in which the ruin of a deciduous tooth is accomplished, by a sort of continuous irritation of the root and the absorption of the dentine, at last leaving behind a stump of dentine that is thrown off? If that be the case, of course we can understand why implantation can be a success for only a limited number of years. But it may be that this same irritation, after a certain amount of dense fibrous connective tissue has been formed upon the root, comes to a standstill; and if that prove to be so, then I cannot help thinking that implantation of teeth has a future. A number of such researches will have to be made before this question can be settled; and I must still urge and insist upon the making of experiments in implantation upon dogs and cats. Your patients do not understand it, and are not easily induced to submit to the operation, but dogs and cats are cheap enough, and we can afford to kill a few for the benefit of science. I think this question will have to be settled by experiments upon the lower animals. As it appears now, good results may be obtained for four or five years; and then, as Dr. Younger says, you can bore a new hole and plant another tooth, and you are all right again.

Gentlemen, do not forget one thing: that five years ago such experiments and procedures as these would have been impossible, and the person attempting them would have been looked upon as an outlaw; for the reason that he would have had to expose his patient to great dangers in implanting dead teeth in their jaws. At that time we did not know how to render such things aseptic and harmless, and the implanting of such teeth would have raised fearful inflammations and led to blood-poisoning, pyemia, abscesses, and death in many cases. Specimens were shown to you in Washington, by a gentleman from Vienna, of pyemia caused by careless extraction. I recollect that when I studied surgery it was not unusual to take forceps which had been used upon a cadaver to extract teeth from the mouth of a living person. Nobody would dare to do that now. It is since we have learned that suppuration depends upon the presence of certain micro-organisms that successful implantation has become possible, for we now understand that it is necessary to render the teeth aseptic by submitting them to certain sterilizing agents, such as corrosive sublimate. I repeat that it is only since that time that we have been able to perform such operations with impunity.

Gentlemen, if you learn how to sterilize teeth, and acquire the perfection in this operation which Dr. Younger seems to have reached, I can say that there is a good deal in Dr. Younger's discovery.

[At this point G. L. Curtis, M.D., D.D.S., of Syracuse, N. Y., read a paper entitled "Microscopical Examination of an Implanted Tooth," which will be found at page 303, in this number.—Ed. Dental Cosmos.]

Dr. G. V. Black. Mr. President: Dr. Curtis was kind enough to show me his slides to-day and to ask me to say a few words in regard to them. I will say that the sections are sufficiently thin to get good observations, but I found them stained with carmine, which for observing such sections I do not think best. Furthermore, the instruments we had did not give me a very good opportunity for observation, and there are some questions relating to the slides that I do not feel like answering: but there are other questions that can be answered definitely.

I found on portions of these roots that the cementum had been absorbed until portions of the dentine had been reached and also destroyed. [Drawing on blackboard.] For instance, let that be the line of the cementum, and there the fibrils. We had here bay-like indentations or lacunæ (?), which we always get in the absorption of bone or the roots of temporary teeth, or pathological conditions of the roots of teeth; and I found these indentations filled with the cells that have been described in relation to the other case, very much as in that case. But this did not extend to all of the root. A considerable portion of the cementum around these roots was yet perfect; its surface was perfect, there being no pitting whatever, and, as far as I could judge, no attachment whatever of the tissue to the cementum. But at one point I found the cementum somewhat irregularly built out; and here we get a filling in of the bay-like excavations with cementum, as I think. Dr. Gray thinks it is bone. This is laid down upon the dentine and the remaining cementum, and seems firmly attached; and to this there seems to be a tissue attachment. I only saw one little spot of this, in the central portion of which it was quite granular, and at one portion there was an opening, as though some of the tissue had dropped out; and there was granular tissue about that. That may have been mechanical and accidental in the making of the section. This little opening I understand Dr. Gray supposed to be an Haversian canal. From the examination I made I do not think it is. I think that tissue is cementum that has been laid down in place of the tissue absorbed,

as we find often in the examination of roots of healthy teeth some little absorption of the cementum, or extending far into the dentine perhaps, has taken place, and this has been repaired by a re-deposit of cementum. This is a common occurrence, and can be demonstrated very readily in many teeth.

Now, if that cementum—and this case looks like it—is deposited upon this root, the only question is to make your implantations so as to obtain a deposit of new cementum over the entire root, and we have a success, and one that will promise success for a lifetime. But there is the difficulty. In "The American System of Dentistry" we have this same class of deposit that I have here described illustrated in old operations of this kind: not exactly of this kind, but replantation and transplantation; we have this same kind of deposit upon the sides of the roots of the tooth there represented. So far as I know, there have been none of these deposits observed of sufficient amount to cover the root or to answer any practical purpose; because the absorption goes on at other points and eventually destroys the root, so far as I know.

Dr. W. H. Atkinson. The honesty of the men who have spoken before you to-night has so impressed me with the rightness of their efforts to get at the truth as it is in nature, that I cannot forbear referring to the points somewhat in detail.

I trembled when Prof. Heitzmann took the stand, for I knew the little points of difference between him and me in the interpretation of what we see through the glass. I know that he has seen a hundred specimens to one that I have seen, but I do not know that his mother built his organs of observation any better than, if as well, as those that were built in my case. As justification of the indorsements that I have given so free-handed to Dr. Heitzmann, see the manner in which he made these drawings; the modest way in which he referred to them and classified them with other examinations that he had made *ad infinitum* before I had the pleasure of seeing him, and made his deductions accordingly. Did he come to any final conclusion? He did say nobly that it looked as though there was yet hope for that kind of assistance to our fellow-men in trouble from the loss of their teeth. When he spoke of the connective tissues on the sides of the two specimens that he examined, all my molecules shouted Hallelujah! These very few specimens can of course give us only a scintillation of the revelation of the truth that lies behind.

Dr. Black just stated what he saw, and modestly took a different view from the one that had been given from the headquarters at Washington. I wish I could see the specimens. I think I could

discriminate between an Haversian canal and a corpuscle of cement. I have yet to see the first real Haversian canal in cement-substance. I think there is one point of deficiency in all who have tried to get names by which to convey to those who are not erudite upon the subject what is seen and thus represented by the names. Prof. Black said that if such cementum as he saw could be proliferated around the entire end of the root, we did have a sure fastening for the implanted tooth that would last a lifetime. I do not propose to take issue with the professor on that.

You saw how perfectly child-like Dr. Heitzmann gave his deductions, that were given but in part. He did not say he knew the whole of it. What are we entitled to say after five years' investigation, when some of us have been at the thing six times five years, anxious to catch the illumination of the truth, that we might stand before our patients and have some foundation that would enable us to say that we apprehended their condition and were able to take measures that should benefit them?

Let me prophesy. The time is coming when we will understand these things and know what implantation is, and be able to discriminate between that which is really past resuscitation and that which is capable of being made part and parcel of the human system again.

My one objection to the remarks of Dr. Black is that he persists in saying that things are dead when he cannot prove that they are dead. How many modifications of life in tissue have we? Seven,—atomic life, molecular life, corpuscular life, tissual life, organic life, systemic life, conscious life: and these know how to build the tissues at the behest of type. Here we have only a microbe, that they call micrococcus. Will they tell us what they mean by this term, and how to interpret these presentments?

Clinic Report.

Dr. C. S. W. Baldwin, of the Clinic Committee, read the following report of the clinics given during the meeting:

The clinics given at the nineteenth anniversary of this society were a decided success. It is estimated that seven hundred members of the profession from all sections of the Union were present. The "out-of-town" representatives preponderated both in numbers and in exhibits. The clinic took the form of an institute fair, where each one repeated the merits of his invention, so that the member from Philadelphia who extolled the quality of his amalgam, or the quiet delegate from Georgia who operated with his new mallet, each had a crowd of listeners. When criticisms were heard it was to

say that "there was too much to see," or that the commodious rooms of the New York College of Dentistry, where the clinics were held, were not large enough.

There was a great variety of operative appliances in the shape of pluggers and engines, electricity coming in largely as a motor. Several operators demonstrated their method of implanting teeth; others filled teeth or treated pyorrhea. In prosthetic dentistry there was much improvement shown in apparatus for melting, casting plates, and making dies for plates or crown-work.

In making this quite voluminous report it seems desirable so far as can be to describe the new methods and improvements and to enumerate the others. Your reporter gave his entire time during the clinic, seeking to obtain accurate information from each clinician. Owing to the great number present, he was unable to see every case, but reports those which came under his observation, giving largely the views of the exhibitors.

Dr. T. W. Brophy, of Chicago, exhibited an improvement on his popular band matrix. The band, which is now made of alloy instead of steel, stretches as gold is impacted against it, thus overcoming the danger of incomplete contact at the margins and allowing contouring when desired. The seamless bands are made separate from the screw and nut, one sufficing to tighten the different sizes when about the tooth. The improvement gives a more useful and cheaper set of matrices.

Dr. J. A. Swasey, of Chicago, sent a new form of rubber-dam clamp for incisors, held by the points wedging between, instead of clasping around the teeth.

Dr. Wm. J. Baulien, of Bridgeport, Conn., demonstrated with an apparatus to even the surfaces of corundum-wheels. A three-inch stone ground on a circular iron plate by a grit where soap and corundum were apparent was evened in a few minutes.

Dr. A. G. Bennett, of Philadelphia, placed in position a piece of removable bridge-work where four crowns were held by a half-cap dovetailed into the adjoining tooth and anchored by a staple of platinum and iridium wire.

Dr. G. L. Curtis, of Syracuse, exhibited a case of bridge-work in the mouth of Dr. S. B. Palmer, where thirteen crowns were fastened to a cuspid and second molar. The incisors were separate from the bridge and made after the Richmond pattern.

Dr. T. S. Waters, of Baltimore, showed a very ingenious removable bridge, where the root was capped with gold. An outer cap attached to the bridge fitted over it, and aided by a spring held the piece in place.

Dr. C. L. Robinson, of New York, put in a practical case of Rich-

mond bridge-work, wherein three porcelain-faced crowns were suspended between a second molar and a cuspid, gold caps covering these teeth and reaching under the free margins of the gum. This case provoked a very free discussion of the merits of the ferruled crown or those without. The advocates of all-porcelain crowns claimed that teeth capped or crowned by a system having a band or ferrule extending to or under the gum were sure to excite local or pericemental inflammation, frequently causing putrescent gums and loss of the member. The supporters of the ferrule theory thought there was lack of stability in a crown without an outside support in the shape of a band, and that when all-porcelain crowns were used the roots were liable to split; and if teeth were united to form a bridge, as in the case presented, they must rest on the gums, which was as liable to produce inflammation in one case as in the other.

Dr. E. Parmly Brown, of Flushing, L. I., displayed several fine cases of all-porcelain crown and bridge work. The gums at the cervical borders and where the crowns rested were as healthy as any other part of the mouth.

Dr. M. Rynear, of New York, showed a new form of his crown having a porcelain front.

Dr. Geo. Evans, of New York, exhibited his gold seamless, contour, crowns and described the following method of expanding a collar or seamless gold crown: Place a soft mass of gutta-percha the size of the collar upon the closed ends of a clamp forceps, and introduce it inside the collar or neck of the crown, previously moistened to prevent adhesion; remove and harden in cold water, cutting through between the points of the forceps. This furnishes a means of expanding collars or crowns in any direction.

Dr. C. W. F. Holbrook, of Newark, contributed an ingenious disk-holder, which was operated by Mr. Fenno. The center of the disk is an oblong metal eyelet. By inserting the cross-head of the holder into this eyelet and giving it a quarter turn it slips into a slot, which, aided by a spring, securely clamps the disk.

Dr. J. A. Kimball, of New York, demonstrated with his non-separable disk-holder; also described his method of lining discolored cavities. After preparing the cavity it is moistened with a saturated solution of chloride of zinc and oxide of zinc, then blown in with a chip-blower. This rapidly hardens, and he is soon able to complete the filling with gold.

Dr. H. H. Sisson, of New York, showed his disk shield.

Dr. S. J. Shaw, of Boston, had a collection of very ingenious rubber regulating plates constructed on the plan of compensating force, the principle involved being of new application in ortho-

dontia. Briefly stated, Dr. Shaw's theory of regulation is that force must be applied in two places at least, and whether the force be the jack-screw, spring, or elastic, if at one point it is applied to bring a tooth into line, the other extreme may be utilized to move in or out as the case requires, without loss of force. This he accomplished by jointed rubber levers in the cases shown. The rubber plates usually cover the molars, and are removable by the patient. Dr. Shaw's method of showing the position of the teeth before regulation began and at completion is worthy of general adoption, making in one cast both views of the case, the heels being together.

Dr. A. W. Harlan, of Chicago, operated for a case of pyorrhea alveolaris. In removing the serumal deposits he used his own form of instruments, involving a push motion, going two-thirds the length of the tooth, or beyond the bifurcation of a molar. The pockets were syringed out with a one-in-a-thousandth solution of corrosive sublimate, and peroxide of hydrogen, as a disinfectant and germicide, followed by a ten-per-cent. solution of resorcin in four days, and repeated eight days after the operation, which is usually sufficient to effect a cure. Dr. Harlan described an original method of operating for recession of gums at the necks of teeth. After removing deposits around the roots of teeth, a crescent-shaped incision is made through the gum about a line from the gingival margin, cutting to the alveolar process if present, if not to the root. Fill this incision with granular iodide of zinc, as a stimulant and irritant, which usually forces the gum by the formation of new tissue in the incision to its original position. In case insufficient new tissue is formed at the first operation two vertical incisions are made, and again packed with iodide of zinc. Fifteen days should elapse between the first and second operations, and in no case cut so as to open or destroy the gingival margin of the gum.

Dr. R. B. Adair, of Gainsville, Ga., treated a case of pyorrhea, removing the tartar. He syringed the gums where separated from the teeth with peroxide of hydrogen. In suppurating cases he uses a Donaldson broach to remove the free tartar, moistening the gum with a saturated solution of creasote and iodine; afterward applying a mixture of tannin, glycerin, and honey, which he said united with the saliva, forming a tannate of albumen. He repeats his treatment every twenty-four hours. Completing the hygienic treatment, he brushes the patient's teeth every morning with a prophylactic toothbrush. He said it usually took from ten to a hundred days to effect a cure.

Dr. E. C. Kirk, of Philadelphia, implanted a central for Dr. Bisbee, of Maine, on Tuesday, and on Wednesday a superior lateral for George Owens, a patient of Dr. Sisson. In both cases a fifty-per-

cent. solution of cocaïne was injected through in front of the border of the gum. As little remains in the tissue, a strong solution of cocaïne is necessary for the desired effect. In the last case the patient said he only felt the pain from the needle, not the drilling of the socket. The teeth were sterilized in Dr. Kirk's apparatus, giving different strengths of bichloride of mercury, and implanted in half an hour.

Dr. G. L. Curtis, of Syracuse, implanted a left superior first bicuspid for Dr. Lamb, of Port Henry, N. Y., and held it in place with a staple of platinum and iridium wire, drilling into it and the adjoining bicuspid and cementing the staple with phosphate of zinc.

Dr. J. Bond Littig, of New York, introduced several cases where he had tipped and contoured front teeth with porcelain, meeting with good results. He uses English teeth; thinks them stronger and the pins nearer the tips, so there is less purchase to break off the piece.

Dr. C. N. Peirce, of Philadelphia, filled a molar with globe foil without dam or napkin, the only precaution being to fill the mouth and cavity with clear water instead of saliva before putting in the gold. Hand-pressure and serrated instruments were used in introducing the gold.

Dr. E. S. Gaylord, of New Haven, burnished in Wolrab and Williams gold, *a la* Shumway.

Dr. J. F. P. Hodson, of New York, built down two central incisors, contouring with Watts's crystal gold, and condensing with hand mallet.

Dr. H. C. Register, of Philadelphia, operated with his engine, which has a self-compensating cord regulating the tension, working a corundum wheel, hand-piece, and mallet. Dr. Register put in a combination filling of gold and copper amalgam, packing the alloy at the cervical wall against a matrix, condensing the gold at the crown with his mechanical mallet.

Dr. F. W. Dolbear, of Brooklyn, exhibited his heroic engine. The drive-wheel is stationary behind the chair. A tall standard with swing arm and S. S. White flexible cable attached, brings the hand-piece over and in front of the patient in convenient position. It seems powerful and adaptable.

Dr. W. G. A. Bonwill, of Philadelphia, demonstrated with his engine, mallet, and hand-piece.

Dr. J. H. Coyle, of Thomasville, Ga., exhibited a small but effective engine mallet, the design of F. C. Price. A pitman drew up and released a spring, giving a rapid and direct blow.

Dr. A. H. Gilson, of Boston, showed his pneumatic mallet, which has a very adjustable and rapid stroke. It was worked by an air-

compressor which may be used as a chip-blower, canal-drier, or to run a blow-pipe. He also exhibited a disk-receiver which secures them in convenient shape for immediate use. His rubber polishers did effective service.

Dr. C. F. Bliven, of Worcester, exhibited a pneumatic mallet worked by the C. & C. electric motor. It was observed that all exhibitors of mallets compared theirs to the electric, claiming equal utility. Dr. A. H. Shattuck, of Pawtucket, R. I., showed some fine specimens of his standard gold alloy, which he says will not shrink, discolor, or bulge. It is a tri-metal alloy, of gold, silver, and tin. The doctor thinks the addition of other metals of no practical value.

Dr. Geo. W. Melotte, of Ithaca, N. Y., gave a clinic showing a great variety of mechanical apparatus. With a reversible, tilting melting cup, he melted two pennyweights of twenty-carat gold in sixty-five seconds. He has a blow-pipe adaptable to either nitrous oxide or illuminating gas, which has a spring key for delicate adjustment. It is supported by a standard with a universal joint. He showed his system of die-making for crown-work. The impression of a short root or the cusp of a tooth is taken in stick shellac or sealing wax slightly warmed, which is placed on a rubber cork, thus forcing back the gum. A rubber tube stretched over the cork and impression completes the mold for the die. Into this is poured a metal fusible at one hundred and twelve degrees. Tin foil is burnished with the hands over the portion taken from the impression, to prevent adhesion, with the rubber tube again forming a mold, another pour is made, completing both dies with one melt of the metal.

Dr. D. Genese, of Baltimore, exhibited a siphon tongue-holder which ejects the saliva when in use, the piece covering the tongue acting as a mirror. Also a dental speculum which aids in operating about the buccal cavities.

Dr. C. R. Butler, of Cleveland, showed a rubber-dam holder having a double buckle.

G. W. Harkins, of Newark, presented electro deposits made on plaster models as a base to build vulcanite plates on. The deposited plate was of pure silver, covered with pure gold, giving, he claimed, a closer adaptation and better fit than by plates struck with dies.

In hygienics, the Horsey Manufacturing Company, of Utica, exhibited a large variety of tooth-cleaners and polishers, in the shape of an adjustable felt tooth-brush. While it seems an innovation on the bristle brush, it evidently would not cause the mechanical abrasion laid at the door of the latter. Seabury & Johnston distributed fine specimens of styptic cotton and napkins, also packages of their antiseptic hydronaphthol.

Dr. W. S. Elliott, of Hartford, demonstrated with a universal separator which seemed a modification of the Jarvis pattern.

Dr. J. G. Morey, of New York, exhibited his compound lever and universal separator.

Dr. L. C. Gilhart, of Susquehanna, Pa., exhibited steel wedges and burs, which he said were tempered by a new process. They seemed none the worse after the very hard usage to which they were subjected.

Dr. J. O. Flower, of Pittsburg, operated a diamond drill which he said was brazed into a steel bit, cutting equally well on the side as the point.

The C. & C. electric motor made a fine display, running an engine or mallet with two, four, or six cells of its battery. The motor runs equally well with a current from an incandescent circuit, taking power from a street electric wire.

The Detroit exhibit was of an electric motor and battery which ran an engine or mallet with varying speed according to the number of cells used. The exhibitor thinks it can be used for dental purposes at a cost of twenty-five cents per week.

Dr. C. C. Carroll, of New York, demonstrated the uses of aluminum in prosthetic dentistry. He mounted S. S. White plain teeth upon a model as for rubber work, and invested it in a perforated iron flask, and by a pneumatic crucible forced the molten aluminum into the matrix, attaching the teeth, making a complete piece, whether for crown, bridge, or plate, in a simple manner. He uses a small gasoline furnace for heating.

B. C. Nash, D.D.S., *Secretary.*

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The First District Dental Society of the State of New York held a regular monthly meeting, Tuesday evening, February 7, 1888, in the rooms of The S. S. White Dental Manufacturing Company, Broadway and Thirty-second street.

The president, Dr. W. W. Walker, in the chair.

Dr. C. S. W. Baldwin, of the Clinic Committee, read the following

Clinic Report.

There were about eighty present at the clinic this afternoon. . . Dr. Wm. N. Morrison, of St. Louis, sent specimens of mineral wool for filling the canals of pulpless teeth. He advocates filling the lower point of the root with gold wire, then with a mixture of oxychloride of zinc and this wool, which has a short fiber, he fills the bulb-

ous portion of the canal. . . Dr. H. D. Allen, of New York, demonstrated his method of investing and packing a set of teeth, using his pattern of flask. . . A "new dental seal" was tested by the members. It is a new preparation of The S. S. White Dental Manufacturing Company, and looks like gutta-percha and oxide of zinc. It is used to cover medicaments when treating or devitalizing teeth. . . Dr. Hamlet, of Hempstead, L. I., showed cases according to Dr. E. P. Brown's method, where a platinum and iridium bar was mortised into a plain tooth, covered with continuous-gum body, and baked; this bar being anchored at one or both ends by a filling in the adjoining tooth. . . Drs. Longnecker, Starr, and J. W. Merwin showed difficult cases for regulation.

C. A. Marvin, M.D., D.D.S., of Brooklyn, read a paper entitled, "Keep Steady," which was briefly discussed by Dr. Atkinson and others.

The society held a regular monthly meeting, Tuesday evening, March 6, 1888, in the rooms of The S. S. White Dental Manufacturing Company, Broadway and Thirty-second street.

The president, Dr. W. W. Walker, in the chair.

Dr. C. S. W. Baldwin, of the Clinic Committee, read the following

Clinic Report.

About one hundred dentists were present at the clinic this afternoon. . . Dr. H. D. Allen, of New York, showed partial dentures having gold caps to cover the few bicuspids and molars remaining in the mouth to prevent the clasps and plates from impinging on the gums, which is a common source of irritation and inflammation. The roof of the mouth was not covered by the plates. . . Dr. Watkins displayed the cusp of a wisdom-tooth which had been imbedded in the angle of the jaw of a woman eighty-one years of age. He also exhibited a regulating case. . . Dr. E. R. E. Carpenter, of Montana, exhibited the following cases of bridge-work: Case 1. Right upper first and second bicuspids and first and second molars to form a bridge, which is to be supported posteriorly by a saddle, anteriorly by a partial cap over the cuspid, and extending and soldered to the backing of a Low crown on the right upper lateral; while a further extension of the bridge consists of a saddle or spur burnished over the palatal surface of the right upper central. Dr. Carpenter made the saddle and partial cap for the cuspid at the clinic, but did not proceed further, except to explain how he would complete the operation. Dr. Carpenter's method of making dies to strike up the saddle is as follows: Take an impression and build a

coffer-dam of moldine around the part you wish the saddle to cover, and pour into it Melotte's metal. After thus obtaining the die proceed to obtain the counter-die by building around the die with moldine and pouring in the same metal (as cool as possible). The saddle is struck up from two thicknesses of No. 30 gold plate soldered together. The second case shown by Dr. Carpenter was one of bridge-work for the superior maxilla, and consisted of twelve teeth supported in the following manner: The only tooth remaining in the superior maxilla was the left cuspid, and this with the right and left first bicuspid roots formed the only support for the bridge. A cap was fitted over the cuspid, and Low steps or posts fitted into the bicuspid roots. The incisors were replaced by Dr. E. Parmly Brown's method, and the rest with gold backings. The porcelain face of the right cuspid had broken away and had been replaced by a piece of gold plate riveted to the bridge, in order to make it look like the cap on the cuspid of the opposite side. Case 3. Bridge-pieces in the lower jaw. On the right side the first bicuspid and first molar were supplied in the following manner: In the right first bicuspid root was put a Low step or post; the second bicuspid was capped, and the first molar was supported by it and a small spur or bracket extending to and resting upon an amalgam filling in the second molar. On the left side three teeth were supplied as follows: The second bicuspid and two molars were attached posteriorly to a cap over the third molar and anteriorly to a partial cap over the first bicuspid, with an extension or spur resting on the lingual surface of the cuspid. This same case presented a specimen of Dr. Land's porcelain facing, wherein a right upper lateral had its posterior border replaced by a piece of porcelain. The method of attaching it was explained by Dr. Carpenter. . . Dr. H. A. Parr exhibited a spring to support the cable of the S. S. White engine. The device consisted of two screw clamps or bands surrounding the metal tube in which the upper end of the cable runs, from which a steel spring extends to and supports the cable sheath, being attached to it by spring clamps. The spring can be lengthened or shortened by moving the end clamp. . . Dr. E. Parmly Brown exhibited a case of bridge-work according to his method in the mouth of Dr. E. M. Cook, of Litchfield, Conn., whereby a missing right upper central was supplied. Nearly all the other incisors had been built down with gold, restoring lost portions. Dr. Brown proposed also to restore the two left upper bicuspids in the same manner, by putting a gold cap over a devitalized first molar and running a platinum bar through its anterior face and into the palatal root, the anterior extremity of the bar to be built into a cavity in the posterior surface of the cuspid. . . Dr. A. L. Northrop: I have here a little appliance which has been sent by Dr.

Bogue with the request that it be shown to the society. It is a siphon arrangement for taking saliva out of the mouth, having openings on the sides instead of at the end of the tube. This obviates the stopping up of the tube by the soft parts of the mouth and allows the saliva to flow continuously. Dr. Bogue came across it in France, and does not know who is the inventor of it. It is now for sale by The S. S. White Dental Manufacturing Co.

[Dr. W. G. A. Bonwill, of Philadelphia, here read a paper entitled "Original Devices for Correcting Irregularities of the Teeth since 1854, not hitherto known to the Profession," which was followed by an extended discussion. The great length of the paper precludes its publication in this issue.—Ed. Dental Cosmos.]

At the annual meeting of the society, held Tuesday evening, April 3, 1888, the following were elected officers for the ensuing year:

President—W. W. Walker.

Vice-President—J. F. P. Hodson.

Secretary—B. C. Nash.

Treasurer—John I. Hart.

Librarian—J. Bond Littig.

Also a Board of Censors for five years, consisting of A. L. Northrop, Frank Abbott, S. G. Perry, William Carr, and A. R. Starr.

Delegates to the State Dental Society for four years: J. W. Taylor and B. A. R. Ottolengui.

B. C. Nash, D.D.S., *Secretary*.

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

The regular meeting of the Odontological Society of Pennsylvania was held at the northwest corner of Thirteenth and Arch streets, Philadelphia, on Saturday evening, February 4, 1888.

The president, Dr. Edward C. Kirk, in the chair.

Dr. D. N. McQuillen, chairman of the Clinic Committee, presented the following report:

The regular monthly clinic was held at 2.30 P.M., at the depot of The S. S. White Dental Manufacturing Co., Chestnut street, corner of Twelfth. . . . Dr. H. A. Parr, of New York, operated for a patient about fifty years old, from whose mouth the inferior left second bicuspid and first molar were missing; gold crowns were fitted to the first bicuspid and second molar, and the intervening space bridged. All soldering was done at once. The entire operation was completed in about two and a half hours, and the doctor made a beautiful piece of bridge-work. The "flux" which he uses

is a preparation of his own, and is of great assistance to him, as the solder flows more freely than with any other; there is no swelling or oxidizing with it. The flux has been placed on sale at the dental depots. . . . Dr. J. W. Ivory exhibited his rubber-dam adjuster and clamp; also, a combined clamp and napkin-holder, and a wire screw-clamp for children's teeth, and for molars not fully erupted. . . . By invitation of the society, Dr. W. Xavier Sudduth, director of the physiological and pathological laboratory of the Medico-Chirurgical College, Philadelphia, and lecturer on histology and hygiene in the Philadelphia Dental College, assisted by several members of the dental class, exhibited a very complete line (about eighty) of histological preparations, both normal and pathological, relating to the teeth and oral cavity. The majority of the exhibits belonged to the students themselves, and consisted of specimens which they had mounted under Dr. Sudduth's direction in his laboratory.

[A paper was read by A. G. Bennett, D.D.S., entitled "Natural Roots and Artificial Crowns," which is printed under the heading of Original Communications, in this issue.—Ed. Dental Cosmos.]

Discussion.

Dr. Register. I have listened with much pleasure to Dr. Bennett's paper, but hesitate to give my ideas in relation to the subject, as I have not made any special preparation with the view of taking part in the discussion.

The subject of artificial crowns and the necessary preparation of the roots opens a wide field for our consideration, and one well worthy of our careful attention. There is no doubt that many failures in crowning could be made successes by more careful preparatory treatment of the roots and placing them in a thoroughly clean state by the use of antiseptics and germicides. I feel that I ought not to bother you any more with the hot-air theory or practice, and would not if I thought there was any other way to accomplish the same result; but this is my one means, and so uniformly has it been successful that I never have any fear of future trouble when I have thoroughly desiccated the interior of the cavity with hot compressed air.

It is not only the bulbous portion of the pulp that is capable of making mischief, but there are minute portions of matter in all parts of the tooth which, unless they are subjected to efficient antiseptic treatment, will in a short time be in a putrescent state and give trouble. All danger from this source is obviated by thorough desiccation, which can be achieved by subjecting them to a blast of continuous hot air, using platinum hair points for the deep canals. I

have been using it for five or six years, and have had universal success; I never had to remove a crown to treat the root, after having placed the crown. I treat the roots in this way, and fill with anything I please, with the same success. The bulbous portions of the pulp-cavity may be desiccated by hot air and filled, and the rest of the canals left unfilled.

In regard to the adaptation of the crowns I have used, the best in my judgment are three in number. First may be mentioned the Brown crowns, used in connection with a double ferrule around the neck of the artificial tooth, passing up under the gum, and gripping the root at its neck. In the middle of this collar is a thin diaphragm made of platinum plate, the tooth pin passing through it and soldered to place.

There is another crown used in bad cases, not so sightly perhaps as a porcelain crown, confined to the back teeth where the tooth has decayed away below the margin of the gum on one or more sides. It is made by putting a simple band coated with zinc phosphate around the neck, and building up a crown with alloy. This can best be done by inserting the filling with a rotating instrument, and rotating it so rapidly that heat will be evolved, thus allowing the alloy to be used dry, and yet in a very plastic state while being manipulated.

The Logan crown is, all things considered, the best in the market; a ferrule can be made to fit the root, and the Logan crown inserted, to do as good service as anyone can expect of a substitute for the natural organ.

Dr. Bennett. I have a model here which I will pass around for the inspection of the members. It is a new attachment or anchorage for bridge-work. It consists of a vertical half-cap, which incloses the inner part of molars and bicuspids, and is retained in grooves on the approximal surfaces and between the cusps.

Dr. Boice. Does not the heated gutta-percha cause pain?

Dr. Bennett. No, none worth mentioning, when it is properly applied. The pin must be finely barbed and heated quite hot, when the softened gutta-percha is at once worked on with the fingers, the depression about the base of the pin being filled at the same time. In this way the principal heating is done before the pin is passed into the canal. If the tooth itself is not too hot, pain can be caused only by an excess of the gutta-percha being pressed from the joint against the gum.

As to immediate root-filling or crowning, I must say that I fail to see how the subject can be made so easy and simple. Yet, I sometimes set crowns at once, and frequently at the second sitting. I have had but one to remove in three years. As long as there is

much odor the work cannot be cleanly. If hot air or wire will burn out the gas and cremate the bacteria, nothing is gained by waiting.

President Kirk. Dr. Parr, we should like to have your views on the subject. Is there any special crown you prefer?

Dr. Parr. I prefer the collar crown, as it prevents leakage and keeps the root healthy; it will not move and become loose as easily as a crown which depends entirely on pins for support, and which is liable to become loose and admit moisture; decay then takes place around the filling, and the crown drops out. The root of the tooth is also liable to split. On the other hand, the collar crown can be so made that it will be successful even where the root is split.

I always clean out the root, treat it, and put on the crown at one sitting. In case of an abscess, I pass carbolic acid or aromatic sulphuric acid through the canal, and then fill, usually with wood and sometimes with oxyphosphate. If there is no fistula so as to allow the antiseptic to go through, I take an instrument and pass through the alveolar process to the root of the tooth, and so give it exit. I can usually strike the root, and if so, I cut it off. I do not know that I ever had trouble after having crowned a tooth, although I have had plenty of unfavorable cases. I have had teeth that had been fractured by blows from a club or a fist, kicks from horses, and falls. In such cases, where the roots are split, I band the parts together, take a piece of gold to fit the top of the tooth, solder a pin or small plate of platinum or gold to it, and cement it in place. It is sometimes necessary to have double ferrules, or have the porcelain come to the edge of the first ferrule, and let the second ferrule surround the root.

Dr. Tees. What trephine do you use to cut through the alveolar process in cases of abscess?

Dr. Parr. I do not use a trephine, but a rose drill. I cut away the end of the root and break down the diseased parts of the surrounding tissues. I am not particular how much I remove; it is not very severe to the patient.

Dr. Tees. In the incipient stages of alveolar abscess do you pursue that treatment?

Dr. Parr. Yes.

Dr. Tees. In treating molars, do you cut off both roots?

Dr. Parr. I do not remember that I have met with a molar with more than one root diseased, but would follow this plan in such a case.

Dr. James Truman. Do you use antiseptics?

Dr. Parr. Yes, usually carbolic acid. I had a case some time ago of a patient who had a fistulous opening through his cheek. I told him it was from a tooth and that I could cure it, but he would not

believe me. He had been under the treatment of several physicians, who failed to benefit him. He told me that they had made several insertions, but all in vain. I removed the filling to convince him I was right, and passed water through the root and fistulous opening out into his cheek. I then cleaned the nerve-canals thoroughly and treated them with dilute sulphuric acid. I left the acid in until next day, then filled the tooth, and have had no trouble since. The fistula closed up.

Dr. James Truman. What do you fill the nerve-canal with?

Dr. Parr. I usually use orange-wood.

Dr. Kingsbury. Do you ever have trouble with pericementitis, caused by the force used in introducing the wood into the canal?

Dr. Parr. No. The wood must not be driven in with a hammer or mallet, but must be shaped to fit the enlarged canal, and a ring cut around the stick of wood at the right distance from the end; after inserting it with just sufficient force to insure its being tight, you can twist it off where it is cut.

Dr. James Truman. Would you have trouble if this filling of orange-wood did not go quite to the end?

Dr. Parr. I do not know; I always go to the end. Even if it goes a little farther, it will do no harm.

Dr. Guilford. When you excise the end of the root, how do you get the piece out?

Dr. Parr. I do not trouble myself to get it out. Nature takes care of that. I suppose it slips out through the opening made.

Dr. Guilford. How can you know where the end of the root is? Can you see it?

Dr. Parr. No, I never see it, but can feel it.

Dr. Kingsbury. What form of plastic or cement do you prefer for setting crowns?

Dr. Parr. For several years I have used Caulk's cement, and prefer it to gutta-percha.

Dr. Kingsbury. Where a case had been in the mouth for several years, and one end of a bridge, for instance, has become loose, how do you remove the tight end, so as to replace it and make it firm?

Dr. Parr. I find that the end of the bridge that has the gold crown on is the end that becomes loose, and the end supported by a tooth or pin is the end that remains tight. I usually in such cases break the porcelain off, and cut the pin off; it may be done in five or ten minutes. I then smooth the edge of the root, with the cement in it, down square, and drill the pins out. This is easily done by merely sharpening a broken drill and working it down by the sides of the pins, and they work out.

Dr. Bennett. I once had occasion to take off a bridge—not one

of my own—which was anchored at the front on central roots by two finely-made ferrule crowns. Instead of breaking off the porcelains, as recommended by Dr. Parr, I took a sharp retaining-point drill in the right-angle attachment, and passed it through the center of the bands at the rear, striking the pin at the floor of the base-plate in each case. I then passed in a fissure-bur, and, passing it laterally while revolving, had the pin cut and the bridge off in a few minutes. I next drilled the pins out of the canals, and also drilled down through the palatal surface of each crown; I inserted and waxed new pins in place, set the bridge in position in the mouth, and seeing that all was right, removed, invested, and soldered as usual. By this method I saved time and labor. Of course, if the facings were checked or otherwise defective, I would take them off. Why break them off merely to get at the pin, which when replaced must be soldered from the rear at any rate?

Dr. Parr. I have done this, but the difficulty is that you cannot always find the pin; and in case you miss it, you have to ream around until you find it, and run the risk of breaking the drill. I think that the best way is to break off the porcelain; since to repair the piece you will have to put it through the fire, and while you are at it it is little more trouble to put on two or three teeth than to put on one.

Dr. Littleton. As root-filling is one of the subjects for this evening, I have brought some new canal-reamers to show the members present. They are not provided with the usual guide-point, but they have such flexible stems and are so short in body that in reaming they must of necessity follow the canal. They are of several sizes, so that a small size followed by a larger renders the operation both safe and practicable. There are many advantages in this system of reamers, which, in connection with an additional appliance, will soon be illustrated in the DENTAL COSMOS; showing that root-canals can be easily and successfully reamed and filled, even at an angle of forty-five degrees. I formerly used cotton, gutta-percha, or oxyphosphate to fill root-canals; but now I first seal the canal at the apex with a suitable dry amalgam stopping about the size of a pin-head, then fill the remainder with cotton and gutta-percha. If necessary to reopen, the amalgam can be cut out with this reamer in a few minutes.

AMBLER TEES, D.D.S., *Recording Secretary.*

MISSISSIPPI VALLEY DENTAL ASSOCIATION.

THE forty-fourth annual meeting of the Mississippi Valley Dental Association was held in Cincinnati, March 7, 1888. The attendance

was unusually large. In the European absence of President Dr. A. W. Harlan, Vice-President Dr. W. N. Morrison presided, and delivered an address. The meetings were made interesting by a large number of papers on a great variety of topics, viz.: "The Dental Pulp," Dr. J. E. Craven; "Conservation of the Dental Pulp," Dr. J. R. Callahan; "Immediate Root-filling," Dr. H. A. Smith; "Implantation," with clinical demonstrations, Dr. M. H. Fletcher; "Constitutional Aspects of Pyorrhea Alveolaris," Dr. J. R. Callahan; "My Experiences with the Dental Pulp," Dr. W. A. Pease; "Gangrenous Tooth-Pulps as Centers of Infection," Dr. W. D. Miller; "Professional Patents," Dr. W. Storer How; "Intermittent Pressure, its Relation to Orthodontia," Dr. L. E. Custer; "Combination Fillings," Drs. W. D. Miller and C. M. Wright; "Resuscitation by Inversion," Dr. J. W. Jay; "Influence and Properties of Iodoform," Dr. E. G. Betty, and a letter from Dr. N. W. Williams, of Geneva, Switzerland.

The papers were discussed by the members, and many matters of interest were considered to which want of space forbids even allusion.

The newly-elected officers are: Dr. H. L. Moore, Cincinnati, president; Dr. J. R. Callahan, Hillsboro, first vice-president; Dr. M. H. Fletcher, second vice-president; Dr. F. A. Hunter, treasurer; Dr. F. W. Sage, corresponding secretary; Dr. A. G. Rose, recording secretary, all of Cincinnati; executive, Drs. E. G. Betty, O. N. Heise, W. Conrad; membership, Drs. M. H. Fletcher, R. E. Taylor, Wm. Taft; publication, Drs. L. E. Custer, W. W. Williams, W. N. Morrison; ethics, Drs. J. E. Cravens, J. I. Taylor, E. T. Binford.

Delegates to the American Medical Association, Cincinnati, May, 1888, Drs. H. J. McKellops, J. S. Cravens, J. R. Callahan, H. A. Smith, E. G. Betty, J. S. Driggs, A. O. Rawls, W. B. Ames, Geo. Watt, and H. L. Moore.

The subject of disreputable American dental college graduates in foreign countries was discussed, and the condition deprecated.

This oldest of our dental associations is also one of the best. Only four original members are living, Drs. James Clark, A. Berry, Wm. M. Hunter, and Charles Bonsall.

LOUISIANA DENTAL SOCIETY.

The tenth annual meeting of the Louisiana Dental Society was held in New Orleans. Brief mention was made of it in the Dental Cosmos for March. There were some papers read which would find place in our pages but for the mass of matter previously in hand and arranged for, sufficient to fill several numbers of the

journal, even with its recently added sixteen extra pages. We can therefore give only brief abstracts of the papers.

Dr. J. Rollo Knapp in the opening address gave short quotations from the writings of the ancients to show their estimation and knowledge of the teeth, and suggested the utility of careful research to discover the exact historic status of pre-American dentistry. Dr. W. D. Dunlap, in a paper on "Saccharine," contended that sugar is not as injurious to the teeth as it is commonly and ignorantly declared to be. Hard candies may fracture frail teeth, and sticky caramels extract faulty fillings, but there are no reliable recorded facts going to prove that saccharine food is destructive to the human teeth. Dr. J. G. McCulloh, under the head of "Illusions," antagonized many prevalent notions, as, for example, that cohesive gold is the only successful tooth-saver; that protracted malleting will not produce pericementitis; that good amalgam properly mixed and packed does not perfectly preserve teeth; that migratory microbes make morbific mince-meat of dental tissues; that a tooth-root can be well filled at a first sitting regardless of conditions; that D.D.S., or M.D., invariably implies practical proficiency in the possessor. Dr. Carl D. Ludwig retrospectively considered the advance of dentistry over the slough of quackery, and exhibited specimens of the former habiliments of some practitioners of present prominence to show that their early professional habits got badly mired in the slough. Bewilderment in the fog of ignorance could be best escaped by climbing up to membership in dental associations, and regularly attending their meetings. Large fees are not certificates of superior skill; neither do low charges indicate professional incompetency, but the aim of the scientific and competent conservative dentist will be to bless mankind by serving best the most patients.

Dr. J. G. Havá presented a paper on the supply of phosphate of lime by the osseous system to the dermoid structures, including the teeth. Hence the ingesta of the mother, the child, and the youth should be rich in calcium phosphates. Ante-natal sustentation draws heavily upon the phosphates in the blood and bones of the mother from the beginning of fecundation, yet the finally completed organization—the mature person—contains but fifty or sixty grains of this solid organic element: such a small amount of mortar for such a complicated yet substantially solid structure! The supply of this essential element by alimentation during gestation and childhood is therefore of the first importance for the production of sound bones and teeth. As well expect a hen to produce eggs without ingesting carbonate of lime, as the maturity of osseous and dentated offspring without the ingesting of the phosphate of lime. The solution of the tribasic phosphate of lime administered in either

soup, sweetened water, or milk meets all the indications and requirements for the production and maintenance of sound teeth in a sound body.

We have no report of the clinical work, but learn that the papers and proceedings will be published by Stuart & Adams, of New Orleans.

CHICAGO DENTAL SOCIETY.

At the annual meeting of the Chicago Dental Society, held on Tuesday evening, April 3, 1888, the following-named persons were elected officers for the ensuing term:

J. A. Swasey, president; J. W. Wassall, first vice-president; W. B. Ames, second vice-president; C. N. Johnson, recording secretary; Louis Ottofy, corresponding secretary; E. D. Swain, treasurer; A. W. Harlan, librarian; Edmund Noyes, George H. Cushing, and J. N. Crouse, executive committee.

Louis Ottofy, *Corresponding Secretary*,
1228 Milwaukee Ave., Chicago, Ill.

VERMONT STATE DENTAL SOCIETY.

The twelfth annual meeting of the Vermont State Dental Society was held at St. Johnsbury, March 21 to 23, 1888.

The following officers were elected for the ensuing year: R. W. Warner, president; W. H. Spencer, first vice-president; G. W. Hoffman, second vice-president; Thomas Mound, secretary; W. H. Munsell, treasurer; G. F. Cheney, F. M. Schell, and E. O. Blanchard, executive committee.

The next meeting will be held at Montpelier, commencing on the third Wednesday in March, 1889.

T. Mound, *Secretary*, Rutland, Vt.

SOCIEDAD ODONTOLOGICA NACIONAL MEXICANA.

At a meeting of the Sociedad Odontologica Nacional Mexicana, held at the office of Dr. Alfonso Maria Brito, City of Mexico, April 7, 1888, the following officers were elected for the ensuing year:

Dr. Joseph Spyer, president; Dr. Juan Falero, vice-president; Dr. Francisco Landecho, secretary; Dr. Enrique Buster, treasurer.

The annual meeting will be held at the office of Dr. Joseph Spyer on May 5.

Dr. Javier Anaya, *Secretary*.

NATIONAL DENTAL ASSOCIATION, U. S. A.

The National Dental Association of the United States of America will hold its next regular meeting at Washington, D. C., July 24, 25, and 26, 1888.

For this meeting, as for all former ones, the authorities of the Smithsonian Institute have kindly granted the use of the Lecture Hall of the United States National Museum. All members of the profession in good standing are invited to be present.

Article II, Section 1, of the constitution reads as follows: "The future membership of this association shall be composed of dentists who may be elected upon application, which application shall be accompanied by credentials of membership in a State society or by a recommendation from five members of this association or of his State society."

R. Finley Hunt, D.D.S., *Secretary*,
No. 1113 F street, Washington, D. C.

NORTH CAROLINA STATE DENTAL ASSOCIATION.

The fourteenth annual meeting of the North Carolina State Dental Association will be held at Raleigh, beginning on the second Tuesday (12th) of June, 1888. The sessions will continue three days.

An excellent programme has been arranged, with interesting clinics as a special feature. A cordial invitation is extended to the profession. H. C. Herring, *Secretary*, Concord, N. C.

MISSISSIPPI STATE DENTAL ASSOCIATION.

The thirteenth annual meeting of the Mississippi State Dental Association will be held at Grenada, Miss., commencing Tuesday, May 15, 1888, the sessions to continue for three days.

Clinics will constitute a special feature of the meeting. All dentists are cordially invited to attend.

E. E. Spinks, *Corresponding Secretary*,
Meridian, Miss.

LEBANON VALLEY DENTAL ASSOCIATION.

The annual meeting of the Lebanon Valley Dental Association will be held at the Highland House, Reading, Pa., commencing May 15, 1888. The sessions will continue two days. All dentists are invited to be present.

C. B. Wagner, *Corresponding Secretary*,
Lebanon, Pa.

PENNSYLVANIA DENTAL SOCIETY AND BOARD OF EXAMINERS.

The twentieth annual meeting of the Pennsylvania State Dental Society will be held at the College of Physicians, Thirteenth and Locust streets, Philadelphia, Pa., commencing on Tuesday, June 5, 1888, the sessions to continue for three days.

Wm. B. Miller, D.D.S., *Recording Secretary*,
Altoona, Pa.

The Pennsylvania State Dental Examining Board will meet for the transaction of business, at the College of Physicians, Thirteenth and Locust streets, Philadelphia, Pa., on Tuesday, June 5, 1888.

Persons who intend to come before the board for examination are requested to notify either the president or secretary, and to show specimens of their work in the operative and mechanical departments.

W. E. Magill, *President*, Erie, Pa.
J. C. Green, *Secretary*, West Chester, Pa.

COLORADO STATE DENTAL SOCIETY.

The next annual meeting of the Colorado State Dental Society will be held at Denver, beginning June 5, 1888.

A cordial invitation is extended to the profession of other States to meet with us, and an earnest request for all the dentists of Colorado to be present.

J. N. Chipley, D.D.S., *Corresponding Secretary*, Pueblo, Col.

DENTAL COLLEGE COMMENCEMENTS.

UNIVERSITY OF TENNESSEE—DENTAL DEPARTMENT.

The ninth annual commencement of the Dental Department of the University of Tennessee was held, in connection with the Medical Department, at the Masonic Theater, Nashville, February 22, 1888.

The valedictory address was delivered by Orton P. Hart, D.D.S.

The number of matriculates during the year was twenty-eight.

The degree of D.D.S. was conferred on the following graduates by Dr. Chas. Dabney, president of the university:

NAME.	STATE.	NAME.	STATE.
David H. Bell	Louisiana.	Benjamin E. Holcombe	South Carolina.
Freddie L. Davison	Tennessee.	William W. Hunt	Alabama.
Wm. B. Elverette (honorary)	Tennessee.	William T. Mowdy	Texas.
Robert C. Gordon	Alabama.	James R. Pennington	Tennessee.
Orton P. Hart	Illinois.		

SOUTHERN MEDICAL COLLEGE—DENTAL DEPARTMENT.

THE commencement exercises of the Dental Department of the Southern Medical College were held at De Give's Opera House, Atlanta, Ga., February 29, 1888, at 8 o'clock P.M.

Colonel Nesbitt, of Atlanta, delivered the annual address, and Jas. A. Wills, of the graduating class, was the valedictorian.

The number of matriculates for the session was twenty-six.

The degree of D.D.S. was conferred on the following graduates by T. S. Powell, M.D., president of the board of trustees:

NAME.	STATE OR COUNTRY.	NAME.	STATE OR COUNTRY.
Andrew J. Boss	Georgia.	J. M. Reese	Georgia.
G. C. Brause	Tennessee.	Benno Wichert	Prussia.
John A. Pepper	Virginia.	Jas. A. Wills	Georgia.

ST. LOUIS COLLEGE OF PHYSICIANS AND SURGEONS—DENTAL DEPARTMENT.

THE commencement exercises of the Dental Department of the St. Louis College of Physicians and Surgeons were held at Memorial Hall, St. Louis, Mo., March 3, 1888. Addresses were delivered by Prof. Pinkney French, Hon. Joseph G. Lodge, and W.W. Graves, M.D.

The number of matriculates for the session was eighteen.

The degree of D.D.S. was conferred on the following graduates of the dental class by Prof. Louis Bauer, dean:

NAME.	STATE OR COUNTRY.	NAME.	STATE OR COUNTRY.
George E. Beal	Pennsylvania.	Albert H. Hammen	Missouri.
John C. Cave	Nebraska.	William G. Lange	Canada.
Henry A. Collins	Illinois.	Carl Summa (*ad eundem*)	Missouri.
Peter H. Eistöppel	Illinois.		

AMERICAN COLLEGE OF DENTAL SURGERY.

THE commencement exercises of the American College of Dental Surgery were held at Weber's Music Hall, Chicago, Ill., March 28, 1888, at 2.30 P.M.

The annual address was delivered by Prof. W. Greene Clarke, M.D.

The number of matriculates for the year was fifty-four.

The degree of D.D.S. was conferred on the following graduates by Dr. T. Davis Fitch, president of the college:

NAME.	STATE OR COUNTRY.	NAME.	STATE OR COUNTRY.
A. G. Goodman	Illinois.	Clark R. Rowley	Illinois.
Leon T. Hale	Illinois.	Robert Steele	Canada.
Lester F. Lerchner	Germany.	G. A. Thomas (honorary)	Illinois.
W. F. Lewis	Illinois.	Luther H. Varney	Illinois.
James M. Newman, Jr	Illinois.	Sumpter M. White	Michigan.

CHICAGO COLLEGE OF DENTAL SURGERY.

THE sixth annual commencement of the Chicago College of Dental Surgery was held at the Grand Opera House, Chicago, Ill.,

on Tuesday, March 27, 1888, at 2.30 P.M. The class valedictory was delivered by Adelbert Henry Peck, D.D.S., and the faculty address by Prof. Truman W. Brophy, dean.

The number of matriculates for the session was one hundred and twenty-six.

The degree of D.D.S. was conferred on the following graduates by Dr. James A. Swasey, president of the college:

John Wesley Alderson,
John Charles Barclay,
George Heinrich Becker,
Clayton William Bennett,
Orrin George Bennett,
Frank William Cady,
Sherman Lee Chappell,
Frank Beaumont Clarke,
Rush Eugene Crissman,
William Gould Dalrymple,
Charles Henry Darling,
Frank Henry Davis,
Samuel Finley Duncan,
William Andrew Fortuin,
Clarence Barnard Freeman,
Robert Curtis Gardner,
Thomas Dimma Granner,
Grant Arthur Goodrich,
Valentine Arthur Gudex,
Alfred Ward Hebert,
Peter Monroe Hendershott,
Albert Frank Henkel,
Thomas Francis Henry,
Richard Herrmann,
James Ward House,
Henry K. Kerman,
Richard Kessel,
William Kuester,
Louis Frank Lattan,
George Edward Long,
Alfred Lowther,
Anthony Mann,
Clare Winchel Marshall,
Edward Martin McIntosh,
Charles James Merriman,
Ewing Van Darian Morris, M.D.,
Hans Theodore Nordahl,
Adelbert Henry Peck,
George Reedy,
Frank M. Russell,
Harry Reid Staley,
Henry Stewart,
Rupert DeGeorge Treen,
Samuel Adolphus Whedon.

NORTHWESTERN COLLEGE OF DENTAL SURGERY.

The third annual commencement of the Northwestern College of Dental Surgery (Department of Dental and Oral Surgery of Lake Forest University) was held at Weber Music Hall, Chicago, Ill., on Tuesday, April 3, 1888. The salutatory was delivered by Eustace Worth Parsons, D.D.S., the doctorate address by Prof. Julien E. Hequembourg, M.D., the valedictory by Bernard John Cigrand, D.D.S.

The number of matriculates for the year was thirty-eight.

The degree of D.D.S. was conferred on the following graduates by William C. Roberts, D.D., LL.D., president of the university:

NAME.	STATE OR COUNTRY.
Emma Louise Benham, M.D.*	———
Elden Tappan Brigham	Illinois.
Bernard John Cigrand	Wisconsin.
Peter John Cigrand	Wisconsin.
Emanuel Kargau	Illinois.
Eustace Worth Parsons	Illinois.
Ernst Pfennig	Germany.
Edward Paul Ryan, M.D.*	———
James Patrick Way, M.D.*	———
Chas. Ranney Whitcomb	Illinois.
Chas. Clement Whitmore	Illinois.

* Candidates for graduation at the close of the scholastic year in June.

Under the increase of the length of the term from one of six to one of nine months, the scholastic year closes on the 27th of June, and the exercises were held to carry out the agreement with those of the senior class who entered the college in 1886, that they were to complete the course of instruction in two years of six months each.

EDITORIAL.

DEFERRED MATTER.

We have in type a paper by Dr. T. Dwight Ingersoll, the text of the dental law of Washington Territory, and other matter of interest, which we have been obliged for lack of space to defer to our next issue.

POWER OF EXAMINING BOARDS—THE INDIANA CASE.

Laws regulating the practice of dentistry are now on the statute-books of a large majority of the States and Territories of the Union. The power of the dental examining boards appointed under these laws therefore becomes a question of vital importance to dentists and those who contemplate entering upon the practice of dentistry. In the case of George Wilkins vs. The State of Indiana, the Supreme Court of that State, on March 2, 1888, rendered its decision, affirming the Court below and sustaining the constitutionality of the act regulating the practice of dentistry.

The plaintiff in error, we are informed by Dr. Chappell, secretary of the Indiana State Board of Dental Examiners, began practice at Marion in December, 1886, and was indicted in the Grant Circuit Court for failing to register under the law which went into effect August 1, 1887. On the trial he pleaded the possession of a diploma from the Delavan College (the board of examiners had refused to accept diplomas from that institution), and attacked the constitutionality of the law. The circuit judge sustained the law, from which decision Wilkins appealed.

In the Supreme Court the opinion of the full bench was pronounced by Justice Byron K. Elliott, as follows:

The indictment upon which is founded the judgment from which this appeal is prosecuted charges that the appellant did practice the profession of dentistry without having obtained a certificate from the board of examiners established under the act of March 7, 1887.

There is entire harmony in the adjudged cases upon the question of the power of the legislature to enact laws prescribing what qualifications a person shall possess who enters upon the practice of a profession requiring professional skill and learning. From the earliest years of the common law, men who engaged in the practice of the professions of law and medicine were required to possess skill and learning, and to obtain evidence of their qualification from the sources designated by law. A long and unwavering line of cases extending from those early years of the law to the present, sustain this doctrine. Eastman vs. State, 109 Ind. 278, and cases cited; Orr vs. Meek, 111 Ind. 40; The State ex rel. vs. Green, 14 N. E. Rep. 352.

This firmly-settled doctrine is thus well stated in a late work: "Where the successful prosecution of a calling requires a certain amount of technical knowl-

edge and professional skill, and the lack of them in the practitioner will result in material damage to one who employs him, it is a legitimate exercise of the police power to prohibit any one from engaging in the calling who has not previously been examined by the lawfully constituted authority and received a certificate in testimony of his qualification to practice the profession. The right of the State to exercise this control over the skilled trades and learned professions, with the single exception in respect to teachers and expounders of religion, has never been seriously questioned." Tredman on Limitations of Police Power, p. 200, Section 87. In even stronger language, Judge Cooley affirms this general principle. Cooley on Torts, 289. This principle extends to many trades and professions, as pilots, engineers, and the like. Tredman on Limitation of Police Power, 624; Cooley, Const. Lim. 743. The legislative judgment that the welfare of the public requires that those practicing the dental profession shall possess the necessary skill and learning, and shall obtain a certificate, is probably conclusive. But, if it were not, the court must take judicial knowledge that it is a profession requiring skill. The fact that the dentist employs his professional skill upon an important part of the human body, is of course known to every one, and cannot be unknown to the courts. As this is known, it must follow that it may also be judicially known that one unskilled in the profession may injure the person who employs him. As this is so, then, as we have seen, the legislature may prescribe the qualifications of those permitted to practice the profession.

The board of examiners established under the law is the lawfully constituted authority, and from it the certificate required by law must be obtained. The legislature, as the law-making power, has authority to prescribe the method of procedure. Its authority does not end with declaring what qualifications he who enters upon the practice of that profession shall possess. As it has plenary power over the whole subject, it alone must be the judge of what is wise and expedient, both as to the qualifications required, and as to the method of ascertaining these qualifications. The courts cannot exercise any supervisory power over the legislature as long as it keeps within the limits of the constitution. Fry vs. State, 63 Ind. 532; Eastman vs. State, supra; Cooley, Const. Lim. 202–206.

It is established law that an act of the legislature cannot be annulled by the judiciary in any respect, unless it clearly contravenes some provision of the constitution. Doubt must be resolved in favor of the validity of the statute. Since this doctrine was announced by Chief Justice Marshall, early in the history of our country, it has been inflexibly adhered to by all the courts. Cooley, Const. Lim. (5 ed.) 218; Beauchamp vs. The State, 6 Blckf. 299; Pittsburg etc. Co. vs. Brown, 67 Ind. 49; Hedderich vs. State, 101 Ind. 564; Robinson vs. Schenck, 102 Ind. 307–319.

As the legislature has exclusive power over the entire subject, it is our duty to uphold the statute as it comes to us from the legislature with the executive sanction. We cannot annul any part of the statute unless it clearly violates some provision of the constitution. We have given full consideration to the appellant's argument, but we are unable to perceive that it even proves that it is probable that some provision of the constitution has been violated; much less does it prove that it has been violated beyond doubt.

It is contended that the act is unconstitutional because it authorizes the Indiana Dental Association to appoint three members of the board of examiners. The argument is that the dental association is a corporation, and that the act, in authorizing it to appoint, enlarges its corporate powers, and therefore violates the constitution by enlarging the powers of a corporation by

a special act. In more particulars than one this argument is unsound. It rests on an undue assumption. Authorizing a corporation to select persons to perform a duty in which the public are interested is in no just sense the enlargement of corporate powers. The designation of the corporation as the selecting body is not the grant of corporate powers. This is very clear to our minds. Clearly the legislature might repeal the act at pleasure, and this of itself proves that no corporate right is granted, for, if there was such a grant, there could be no valid repeal. It is quite as clear that a statute which directs a person, artificial or natural, to perform a particular act is not, for that reason, transformed from a general into a special statute. But granting (and the concession can only be made for the argument's sake) that the authority to appoint members of the board of examiners is a corporate act, still, the concession would by no means lead to the conclusion that the statute infringes upon the constitution. The provision which it is asserted the act violates is this: "Corporations other than banking shall not be created by special act, but may be formed under general laws." It cannot with the faintest tinge of justice be affirmed that the simple delegation of authority to appoint three men to perform duties affecting the public is the creation of a new corporation. Changes of infinitely more importance have been held not to create a new corporation. Wallace vs. Loomis, 97 U. S. 146; Atty. Gen. vs. The North Am. etc. Co., 82 N. Y. 172; South vs. Pacific R. R. Co., 6 Sawyer, 157.

The general rule is thus stated by a late writer: "A special act of the legislature regulating an existing corporation or granting to it new privileges, without altering its charter or affecting its charter contract, would not be in violation of the letter nor of the spirit of the constitutional prohibition." Moranetz on Corp., Section 12. The case of the Corporation of Bluffton vs. Wiley, 111 Ind., declares a similar doctrine. But it is really not necessary to inquire how far a corporate grant may extend without violating the constitution, for we are well satisfied that the delegation of the naked power to name three members of the board is not a grant of corporate power.

The objection that the act invests the board of examiners with judicial functions is fully answered by the cases of Elmore vs. Overton, 104 Ind. 548; Eastman vs. State, supra, and the cases there cited. If the appellant were correct in his assumption, then every school examiner who examines an applicant for license; every clerk who accepts and acts upon affidavit; every auditor who accepts an abstract of title when he loans school funds, and every officer who approves a report, would exercise judicial functions. That they do in some degree act judicially is true, and so does every officer from the Governor to constable, who is invested with discretionary powers; for the Governor, when he issues a requisition for a fugitive from justice, decides many things, and the constable when he executes a writ or a warrant exercises a discretion, but no one of these officers exercises judicial judgment in the sense that a court or judge does. These officers, one and all, are ministerial officers, and not judges or courts, and the judicial functions meant by the constitution are such only as courts or judges exercise. A judicial duty within the meaning of the constitution, is such a duty as legitimately pertains to an officer in the department designated by the Constitution as the judicial. By this designation is meant the judiciary in the true sense of the term.

This case falls within the class of cases represented by Maynes vs. Moore, 16 Ind. 116; Flournoy vs. City, 17 Ind. 169; Pennington vs. Streight, 54 Ind. 316; State vs. Johnson, 105 Ind. 463–467; Weaver vs. Templen, 14 N. E. Rep. 600;

Betts vs. Dixon, 3 Conn. 107; Crane vs. Camp, 12 Conn. 463. In Flournoy vs. City, supra, the court said: "An act is none the less ministerial because the person performing under it may have to satisfy himself that a state of facts exists under which it is his right and duty to perform the act." It is a mistake, therefore, to assume that the statute must conform to all the requirements as to notice and like incidents, that would be necessary if the act were judicial. We cannot, therefore, hold the act unconstitutional because it does not make such provisions as would be necessary if the examiners constituted a judicial tribunal. We suppose a successful defence might be made by a person who had in good faith sought an opportunity to obtain a license and failed through the fault of the examiners to meet at the time appointed, but one who has had notice and failed to avail himself of the opportunity, as was the case here, cannot successfully defend. The time and place of meeting of the board are to be fixed by the persons whom the law has vested with authority, and one who desires a license must, at least, make reasonable inquiry; for a public law gives him notice, nor is an applicant delayed until the meeting of the board of examiners, for section 7 of the act expressly provides that "any member of the board may grant a permit to any person who shall file with the member his application therefor." There is, therefore, no denial of an opportunity to acquire a permit, nor any delay required, for a permit may be had at any time upon application. The way, therefore, is always open, and no one need be in doubt what course to pursue. One who has a way always open to him by which he can attain what is required to protect him has himself to censure if he does not use diligence to avail himself of the opportunity afforded him. If the permit is obtained under section 7, then notice is necessarily imparted; but where the party must himself take the initiatory step, he cannot insist that notice shall be given him before prosecution.

If it were conceded that counsel were right in asserting that section 11, which provides the method in which compensation of members of the board of examiners shall be fixed, is unconstitutional, it would not avail the appellant, for, if all that part of the statute were annulled, there would still be a complete law, fully prescribing rules and adequately defining the offence charged. It is perfectly well settled that a part of a statute may be declared invalid, and if enough remains to constitute a complete statute, that which remains may be enforced. If, therefore, all that part of the statute which relates to the compensation of members of the board of examiners should be rejected, the appellant would derive no benefit, for the valid part of the statute fully prescribes the duties of those who assume to practice dentistry, and fully defines and creates the offence described in the indictment.

Arguments that might perhaps not be without weight if addressed to the legislature are adduced by counsel, but, as these arguments all bear upon questions of pure legislative policy, they can have no weight with the courts. All that the courts can do, even though they may be impressed with the need of amendments, is to test the statute by the constitution, and, if it sustains that test, they must uphold it as it is written.

It is urged that the State did not prove that the Indiana Dental Association was duly incorporated, and that for this reason there should have been an acquittal. This position is untenable. It is so because it is immaterial whether the association was incorporated or was not, for the legislature might have authorized an unincorporated association, as well as an incorporated one, to select three members of the board of examiners. It is so, because granting that only a corporation could be authorized to appoint, the corporate existence

cannot be questioned in a collateral proceeding. It is so because the legislature has recognized the existence of the association, and this creates the presumption, if indeed it does not do much more, that it had a legal existence.

Finding no error in the record, we affirm the judgment.

THE STATE OF INDIANA,
Supreme Court.

I, WILLIAM T. NOBLE, Clerk of the Supreme Court of the State of Indiana, certify the above and foregoing to be a true and complete copy of the opinion of said Court in the above entitled cause.

IN WITNESS WHEREOF, I hereto set my hand and affix the seal of said Court, at the City of Indianapolis this seventh day of March, 1888.

{SEAL} WM. T. NOBLE, *C. S. C.*

BIBLIOGRAPHICAL.

A MANUAL OF PHYSIOLOGY: A Text-Book for Students of Medicine. By GERALD F. YEO, M.D. Dubl., F.R.C.S., professor of physiology in King's College, London, etc. Third American from the second English edition. With 321 illustrations and a glossary. Small octavo, 741 pp. and index. Philadelphia: P. Blakiston, Son & Co. 1888. Price, cloth, $3.00.

The author in his preface to the first edition of this work speaks of it as an elementary treatise, and in so doing fails to claim the position to which the volume is fairly entitled. Although strictly speaking a manual, it is more than is ordinarily understood by this term. It is in fact a well-condensed but thoroughly systematic discussion of the subject of physiology; and, while the book is admirably adapted for students of medicine, it must prove convenient and useful to the practitioner. If lacking in scientific nicety, the lack is more than compensated for by the plain, common-sense presentation of accepted facts.

THE PRACTICAL DENTIST: A Monthly Journal for the Dental Practitioner. Vol. I, No. 1, April, 1888. Dr. C. W. Munson, Toledo, O.

This is the first issue of another candidate for the favor of dentists in the line of dental journalism. It is edited by Drs. W. E. Blakeney and F. O. Brake. It starts with thirty-two pages, devoted to dentistry and cognate subjects, and promises to be "independent, and always champion what it believes to be for the best interests of the profession."

PAMPHLETS RECEIVED.

Physical and Mental Inheritances. An Address read before the American Academy of Dental Science, by Thomas C. Stellwagen,

M.D., D.D.S., A.M., professor of physiology in the Philadelphia Dental College. Boston, November 15, 1887. Newton, Mass.: "Newton Graphic Press," 1888.

Proceedings of the National Association of Dental Faculties. Fourth Annual Session, held at Washington, D. C., September 3, 5, and 6, 1887. Constitution and Codified Rules governing the Association. List of Membership to January, 1888. Indianapolis: A. B. Baker, printer; 1888.

Philadelphia Social Science Association: Chairs of Pedagogics in our Universities. A Discussion of the Science and Art of Education as University Disciplines. By Edmund J. James, Ph.D., professor in the University of Pennsylvania. Philadelphia: Published by the Association, 720 Locust street.

Transactions of the Dental Society of the State of New York, at its Nineteenth Annual Meeting, held at Albany, N. Y., May, 1887. Rochester: John P. Smith, printer.

OBITUARY.

NICHOLAS N. NOYES, D.D.S.

Died, in Boston, Mass., March 22, 1888, of pneumonia, Nicholas N. Noyes, D.D.S., in the fifty-fourth year of his age.

Dr. Noyes was born at New Durham, N. H., March 25, 1835. He graduated at the Boston Dental College, in the class of 1870, and was subsequently appointed professor of dental art and mechanism in that college, holding the position for ten years, up to the time of his death; was also a member of its board of trustees for several years. He was considered an able lecturer, and was highly spoken of by his associates.

At a special meeting of the faculty of the college, held March 23, resolutions were adopted regretting the decease of Professor Noyes; expressing its sense of the great loss the college had sustained by the death of one of its "oldest professors, staunchest supporters, and most devoted teachers, in whose life and labors was found an example of professional zeal, coupled with rare ability as an earnest instructor, which deserves emulation." It was resolved that the college building be closed on the day of the funeral, that the students be requested to attend, and that the faculty attend in a body; that a copy of the resolutions be presented to the widow with assurance of deep sympathy in her bereavement, and that they be sent to the journals for publication.

JOSÉ M. PEREZ, D.D.S.

Died, at the City of Mexico, March 7, 1888, of typhus fever, José M. Perez, D.D S., in the thirty-sixth year of his age.

Dr. Perez was born in Sancti Spiritus, Cuba. He graduated with the highest honors at the Pennsylvania College of Dental Surgery, class of 1875. In search of a good climate for the health of his only child, he was induced to locate in the City of Mexico, in 1886, and at the time of his decease he was vice-president of the Sociedad Odontologica Mexicana.

Dr. Perez was a dentist of good repute, an enthusiast in his profession, and his affability had won for him the confidence and esteem of a very large circle.

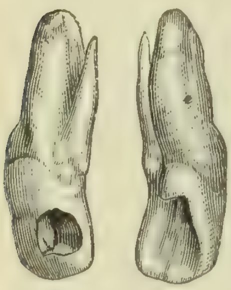
DR. JOHN M. CROWELL.

Died, in New York City, March 13, 1888, of Bright's disease, Dr. John M. Crowell, in the sixty-eighth year of his age.

Dr. Crowell was born in Philadelphia, Pa., December 22, 1820. The greater portion of his life was spent in the practice of dentistry in New York City. He gave his special attention to the mechanical department, and was considered an adept in the carving of porcelain teeth for special cases. He was many years ago identified with the New York Institute of Dental Science and Art, which was the nucleus of the New York College of Dentistry.

HINTS AND QUERIES.

Aluminium.—The readiness with which aluminium alloys with other metals, and the fact that it does not oxidize nor tarnish in contact with the oral fluids, would seem to indicate its adaptability for use as a material for filling teeth, or for dental appliances and fixtures. Has any one experimented with it for such purposes or as a component part of a dental amalgam ?—D. W. B.



Dental Anomaly.—The illustrations exhibit the labial and palatal aspects of a supernumerary superior left lateral incisor which was extracted several years since from the jaw of a lad fifteen years old. It was one of *five* superior lateral incisors ; the four others being left in position.—W. W. Swazey, Springfield, Mass.

Alveolar Abscess.—I first fill the cavity of a pulpless tooth with a packing of common vulcanizable rubber ; charge the hypodermic syringe with carbolic acid and alcohol ; push the pipe through the rubber, and inject the abscess without any leakage around the pipe.—E. C. Brownlee, Edina, Mo.

Thinking it might be an item of interest for the readers of the Dental Cosmos, I will state that dentists are now by statute exempt from jury duty in the Territory of Wyoming.—R. J. Gardinier, Laramie, Wyo.

THE

DENTAL COSMOS.

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ORIGINAL COMMUNICATIONS.

GERM-POTENCY, LIME-SALTS, AND THE TEETH.

BY T. DWIGHT INGERSOLL, ERIE, PA.

It is well, perhaps, that naturalists have called attention to the inevitable conclusion that life—human life, the life of animals, and the life of plants, wheresoever it may be found—is essentially the same. It is also of some importance to know that man belongs, by scientific classification, to that grand division of nature, the animal kingdom; and if it be true that man has no important organ that is not possessed by some animal, it may be equally true that man's dental organs exhibit no essential peculiarity that had not been introduced among animals before he came into existence. The intimate relation which exists between animals and the human family is a very important one, as it aids the investigator in comparing human teeth with those of animals. In that way a gradual improvement of teeth is seen from the simplest in form among fishes to the most complex and useful in the highest animals. Every peculiarity of man's teeth seems to be an inheritance from animal ancestors, and by a study of those previous forms and modes of development we may get a more intelligent view of the formation of our own teeth.

Microscopy has revealed many wonderful facts in regard to them, but as to *how* the mineral substances of which they are composed are brought together and arranged in tooth-form, having a density greater than that of any other part of the body, the microscope offers no satisfactory explanation. It need not be supposed that the laws for the crystallization and segregation of minerals will operate in the animal as they do in the mineral kingdom. When those lens-like mineral concretions called cone-in-cone, which are now found in the rocky shores of Lake Erie, having a pavement of tooth-like cones on both upper and under surfaces of the inclosed disk, were formed in the ancient Devonian seas, the lime with a little iron

and magnesia, of which the cones are principally composed, came together through concretionary action, and by combining with one another chemical action took place, which resulted in the formation of cone-in-cone, a structure which, before that time, the world had never known. During the same age of the world, and in the same Devonian seas, another conical form, but more thorn-like, came into existence for the teeth of fishes. This form was also new to the world, but the two were different, not only in form but in constitution, because the conditions for their occurrence were not the same, and each was influenced by the laws in its own kingdom. Cone-in-cone was formed in the limy sediment of the ocean, while the teeth arose from the living matter in the body of fishes, and those first teeth were typical of all that were to follow, with modifications suited to the necessities of the various species, and the differences between the forms of lime in the mineral and animal kingdoms have continued until the present time.

Microscopists speak as though lime-salts in a liquid, crude state were deposited in tooth-form particle by particle during the progress of development. Dr. Frank Abbott is reported as saying, "Lime-salts were deposited around the living matter or dentinal fibrils and its branches." It can hardly be supposed that Dr. Abbott intended to convey the idea that they were deposited like incrustations on plants and other objects in the water of mineral springs, nor by crystallization as in rhomboidal crystals of transparent calcite, nor in the many-sided crystals of dog-tooth spar. The frequent use of the term by other microscopists and writers generally, gives the impression that some really believe that lime-salts are deposited according to the laws by which minerals are governed. While various forms of lime occur in the mineral world, we may suppose that teeth come into existence through the action of laws that control animal life, the distinction being one of the landmarks between the two great kingdoms of nature. There is a difference between the lime in the bones and teeth of man and animals and the lime that is found in cone-in-cone, dog-tooth spar, and calciferous geodes, each kind of structure having been formed under different laws.

There is some evidence in favor of the belief that there is a potency in the germ of every animal and of every plant by which it is built up in the typical form of the species to which each germ belongs. Germ-potency determines not only the time for the appearance of an organ, but directs also its form and function. It seems to have no object in view but to build itself up into an organism like that from which it came without any mineral substance except that which might be obtained from food by transformation. Crude lime may sometimes enter the substance of a tooth

by accident, as it were, and make the tissue at that point a little defective, but it is supposed that no foreign matter is needed in the teeth, and that they may arise from nutriment with the same facility as do hair and nails and flesh and blood. The germ seems to possess a potency not only for successful development but for the repair of injured tissue. This subject was probably before John Tomes's mind when he published, in 1859, his "Chemico-Vital Theory." "If a tooth is attacked," he says, "and the dentine exposed, irritation is conveyed to the pulp through the dentinal fibrils, and reacts against the invasion of disease by throwing lime-salts into the fibrils, causing their calcification, and thereby the entire solidification of the tubuli. By these means a solid wall of dentine is presented to the advancing disease."

From the fact that but little repair of the human teeth has been discovered, though a great need of it has existed, we may perhaps infer that nature is not inclined, or has not the ability, to do as much in that respect for man as for animals. The self-sharpening, chisel-shaped teeth of rodents are continually supplied with new tooth-substance as fast as the cutting edge is worn away. Nothing like it is known in the human family. When the craw-fish loses a craw-arm in a fight with one of his fellows, or by any other means, another craw-arm, just like the original, is reproduced in its place. The probability is that the substances used for the repair of the beaver's abraded teeth and for a substitute for a crab's lost arm were manufactured (if a business term be admitted) in the bodies of those animals from their daily food, though the new material may not be precisely like the substances that constituted the original parts. Just so in the human tooth. The lime-salts of repair may not be precisely like those of the original dentine, because the organization is not in the same condition for transforming nutriment into dental tissue during old age or during middle life, even, as it was at the time of development; nor is functional action precisely the same.

It may be said by those who oppose this view of nature's processes that lime-salts are contained in the food, and may be deposited in tooth-form just as they are deposited on the outside of teeth, and in the bladder and other cavities of the body. It is admitted that such masses of lime are deposited particle by particle as are the incrustations on the inside of a steam boiler; but they are entirely without structure, the particles being cemented together without being connected with any physiological process. A tooth is a structural organ whether it be that of an animal or a man,—structural internally and externally, the arrangement of its molecules being peculiar to the species to which it belongs. It is known only in animal life.

ON THE METHODS OF STUDY OF THE CROWNS OF THE HUMAN TEETH, INCLUDING THEIR VARIATIONS.

BY HARRISON ALLEN, M.D., PHILADELPHIA, PA.

THE mammalian tooth has been described almost entirely as a topographical area. It possesses "hills," "valleys," "islands," and "boundaries." Lyddeker describes the teeth of the rhinoceros with the terms "crochet," "costa," "valley," and "collis or hill." Fred. Cuvier treats all depressions as the essential elements, and to a great extent ignores the cusps,—a disposition that is still followed by writers who state that the lower human molar is distinguished by a cruciform sulcus. Salter ("Dental Pathology and Surgery," London, 1875, p. 28), in speaking of a deformed tooth, says it is "bulged in forming a pit." Even so careful a writer as Prof. Flower ("Encyclo. Britannica," art. "Horse") describes the incisor of the horse as undergoing "an involution of the external surface of the tooth by which what should properly be the apex is carried deeply into the interior of the crown, forming a fossa or pit." In this account the morphological integer is a space which performs a definite action. The fact that two cusps exist, and that the "pit" is simply the interval between them, is not alluded to. I have undertaken elsewhere (DENTAL COSMOS, 1874, xvi, 617) to show the importance of describing the cusps of teeth only, and of ignoring the forms of the interspaces.

Apart from the insistence that the cusp is the dental integer, each mammalian tooth can be studied from as many as six different points of view. That these are not too minutely considered will be evident from the following statements. The illustrations will be taken, for the most part, from the human subject.

(1) The study of the size of the tooth when taken in connection with the development of the skin is of importance. In the human subject hirsute states of skin are associated with small brachyodont teeth. The small size of the teeth of the sloth cannot be separated from an excessively dense hairy growth. The subject requires careful elucidation, for if it be accepted that a connection exists between the skin and the teeth, other states besides mere hairiness enter into the problem if we are to form conclusions from groups so far removed from one another as are the Sirenia, the Cetacea, and the Edentata.

(2) The study of the anterior and posterior borders,—the "yokes" of the tooth,—the "yokes" especially of the premolars and molars, is of great morphological importance. The "yokes" are best developed in the teeth of the mandible. The anterior "yoke" has a distinct history from the posterior, and is infrequently the seat of development

of a separate cusp. The posterior "yoke" often furnishes a separate cusp. The yoked cusps are always placed in the lines of the greatest impact, being commonly on the outer side of the tooth and passing thence to the middle of the center of the posterior border but never to the inner. Their position thus becomes to the observer a delicate test of the directions of attrition-movements on the crown.

I have found it convenient to represent the positions of the "yokes" in strict connection with the true cusps, and in enumerating them to regard them as parts of fractions. Thus the first molar of the right side of the lower jaw in fifty-two examples of human teeth exhibited three cusps on the outer and two on the inner side,—the tooth of course having five cusps. The formula $\frac{3}{2}$ expresses the number and positions of the cusps if we arbitrarily accept the numerator as representing the outer and the denominator as the inner part of the tooth.

The formula $\frac{2}{2}{}_{\circ}$ represents that the posterior "yoke" is not on either the outer or the inner border of the tooth, but in a position midway between them. The formula $\frac{2}{2}$ expresses the fact that the posterior "yoke" is absent.

In 50 examples the first molar yielded the following expression:

$\frac{3}{2}$ present 34 times.
$\frac{2}{2}{}_{\circ}$ present 4 times.
$\frac{2}{2}$ present 9 times.
$\frac{3}{3}$ present 3 times.

In 56 examples of the second molar the following was met with:

$\frac{3}{2}$ present 5 times.
$\frac{2}{2}{}_{\circ}$ present 14 times.
$\frac{2}{2}$ present 32 times.
$\frac{3}{3}$ present 5 times.

In 30 examples of the third molars the following was seen:

$\frac{3}{2}$ present 6 times.
$\frac{2}{2}{}_{\circ}$ present 6 times.
$\frac{2}{2}$ present 13 times.
$\frac{3}{3}$ present 5 times.

On the left side the results were so similar that they need not be separately tabulated. If the shifting of the cusp from the outer side to the center of the posterior border be accepted as a test of the position of the greatest impact, it follows that this method of studying teeth presents a means of determining that the lateral impact is greater in the first molar than in the second, that the posterior impact is greater in the second than in either the first or the third, and that in the third it is indifferent.*

* In "Anthropologia," p. 434, it is stated on the authority of Hamy that in 59 first mandibular molars 29 were pentacuspid, and in 50 second molars but 10 were

(3) The foregoing considerations are closely related to the manner in which the teeth were worn. I have found it a useful method of studying the effects of attrition to observe that the $\frac{3}{2}$ type will present the greatest attrition on the outer border, and the $\frac{2}{2}\circ$ or $\frac{2}{2}$ type will show a distinct disposition to posterior wear,—a fact not mentioned by Topinard ("Anthropology," Eng. Trans., p. 138), who assumes that the "wear" is always on the outer side.

If attempts be made to correlate the manner of wearing down of the crowns of the molars in man with those of the shapes of the condyloid processes and of the glenoid fossæ (points which have been especially elucidated in quadrupeds by Profs. Cope and Ryder), great difficulty will be experienced. After making many observations of human crania, I am compelled to acknowledge that, with our present means of study, no coördination can be established.

(4) In every mammalian tooth a disposition exists for the main cusp to be duplicated by a second placed to its inner side. It is constantly seen that the second cusp is the smaller and is at first placed in line with the main cusp. In states of specialization the inner cusp in many groups becomes larger than the external, and passes backward so as to encroach upon the privileges of a second pair. In this manner two lines of changes are detected by which complex forms of teeth are evolved from the simple ones,—viz., a duplication of the initial cusp on an interior line, and a development of the duplicated part posteriorly. As in the case of the "yoke," it is the hinder part of the cusp which gains. This variety of tooth-structure, while best presented in the tertiary mammals, particularly as studied by Cope (see Hayden's "Geological Survey of the Territories," iii, 1884), is also seen in the variations of the molars of the human subject.

(5) Yet another method of study of the teeth pertains to the relative size of the members of the same series. Thus the comparisons of the sizes of the incisors and molars are of first importance. That the first molar should be greatly larger than the second, while the third proves to be as large if not larger than the first, forms a heterodont series which is opposed to the gradual loss of size from before backward. The abrupt is also the unusual, and the breaks or "faults" in the series are indicative of vital failure in more than one direction.

(6) The order of congenital loss or excess constitutes the last method which will be here named. I need only allude to the labors of W. Turner, Spence Bates, W. H. Flower, and lately of Schlosser, in this connection. A true method would compel an

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pentacuspid—the remainder being quadricuspid. The relative positions of the cusps are not given.

acknowledgment that the missing factors in the dental formula of each and every species should be carefully considered by the odontologist. In a word, that the determination of the missing teeth in the formula would be a part of his method of study.

Series of forms which are constant in one group but variable in another closely-allied one are always to be carefully observed. The rugæ of the mouth in the human subject may be named in this connection. The dispositions of these folds are variable on the two sides, —*i. e.*, the right and the left,—each being disposed in its own way to adapt the folds to the conformation of its own parts. The entire series would appear to be in coördination to the disposition of the facial bones to grow downward rather than forward, and to the fact that the involution of the sacs of the permanent incisors takes place on the palatal side of the deciduous teeth and creates elements of variation in the anterior portion of the hard palate as contrasted to the posterior part. The lateral incisors in a normal condition always enter the dental arch from the palatal aspect, and this entrance most probably is a disturbing element in the arrangement of the rugæ, especially at or near the premaxilla.

A CASE OF CLOSURE OF THE JAWS.

BY RICHARD GRADY, M.D., D.D.S., BALTIMORE, MD.

Miss G., whose home is in a neighboring State, was brought to me by a surgeon for the application of plates in treatment of closure of the jaws. His statement of her condition, which I am authorized to publish, was as follows: "When four or five years old she had an abscess (from some unknown cause) just over the right masseter muscle. The abscess did not communicate with the mouth, but opened on the cheek about one-quarter of an inch below the zygoma and on the ramus of the jaw. Gradual contraction with closure of the jaw took place. From the statements of the patient and of the parents, several efforts had been made to stretch the ligamentous bands without any apparent success."

December 24, 1887, when the patient first came to my office, she was about thirteen years of age. At that time when the jaws were separated the space between the upper and lower incisors was fully one-quarter of an inch (Fig. 1), and the contraction was very rigid. A faint cicatrix was visible over the masseter muscle, and the muscle itself was somewhat depressed. On examining the region, the ramus of the jaw could be felt on the diseased side from the angle to the zygoma much more distinctly than on the sound side, indicating that the masseter muscle in great part was atrophied

and replaced by cicatricial tissue, which by its constant contraction for years had produced the closure of the jaws.

Impressions of the anterior teeth above and below were obtained with difficulty. Vulcanite plates were made to fit these teeth. In the median line a half-round cut was made in each plate to receive the point of a hard-rubber screw. By gradual dilatation at the hands of the surgeon, in whose home the patient dwelt during her stay in Baltimore, the one-quarter of an inch space between the upper and lower front teeth became three-quarters of an inch January 21, 1888. The method of dilatation was to judge by the resistance at each turning of the screw whether further stretching would be at the risk of the rupture of the cicatricial tissue. The plates and the screw were retained five minutes at a time, and as a rule were used eight or ten times daily. The masticating movements of the jaw were encouraged by providing the young miss with chewing-gum.

When the last thread on the screw was reached in connection with the small plates referred to (Fig. 2), it was possible to obtain

FIG. 1.

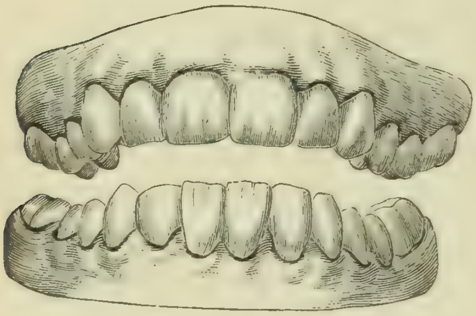
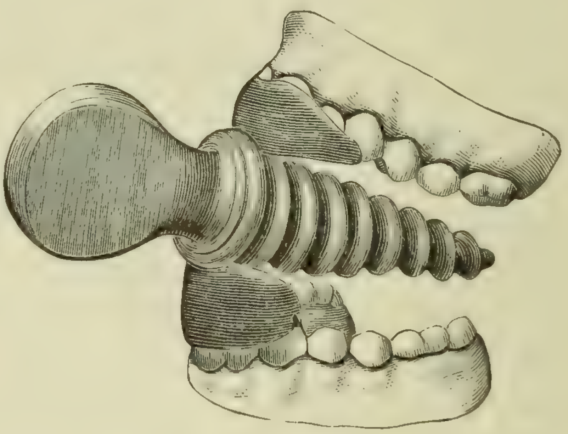


FIG. 2.



impressions of all the teeth. Upper and lower plates were made to fit these teeth loosely, the space previously gained by the small plates being utilized for the reception of full plates, with which the screw was also used.

The space between the upper and lower teeth, April 9, 1888, measured in the median line one and a half inches. The patient's mother, under date of April 10, 1888, wrote to me as follows: "Enclosed please find check for the amount of your bill. I must thank you for your kind and serviceable attention to my little girl. She arrived home yesterday, and the improvement of her mouth is wonderful. It will ever be a source of great comfort and gratification that you attended her. With kindest regards from her to you I am gratefully yours."

SYRINGE FOR THE TREATMENT OF POCKET DISEASE OF THE ALVEOLUS.

BY J. N. FARRAR, M.D., D.D.S., NEW YORK, N. Y.

In 1885 an account of this instrument and its uses was published, showing by illustration its external appearance.* Since that time, so many dentists have spoken enthusiastically of its efficacy in the treatment of loculosis alveolaris, or, as it is more generally known, pyorrhea alveolaris, that I have thought it might be sufficiently interesting to the profession to show its internal construction, so as to enable them to order the syringe from any surgical-instrument maker, for it is not now procurable in market. Without going into the medical aspect of the treatment of this disease, and confining my remarks to the mechanical, it is well known that after the hard deposits have been detached from the roots, or after cutting loose necrotic tissue, if present, it is necessary, in order to effect the most rapid cure, that the *débris* be thoroughly washed away, leaving no particles to be "ulcerated out," as is too often the case. This requires water in sufficient quantity to flood out the pockets with a vigorous stream, long continued, which implies a syringe of considerable size. For this purpose I make use of four syringes, with capacities varying from two to four ounces, made from my own designs.

While the nozzle is of the same form as those used on the Farrar alveolar abscess syringe, the points are somewhat larger than the "proboscis size;" indeed, several sizes are necessary to meet all cases. While one end of the body of the nozzle is screw-threaded to fix it firmly to the syringe, the detachable thumb-hub to which it is attached has a smooth hole through it, which fits a tapering stub, enabling it to be easily and quickly removed and readjusted when charging the syringe with water. By way of variety, one of my larger syringes has a little hollow thumb-wheel stop-cock set in a fixed hub, but this is not as convenient as the other.

As these delicate points of the nozzle would be easily broken by the weight of such large syringes, finger-hooks are made to project from an annular ring around the head of the syringe, to enable it to be hung upon the edge of a deep tumbler ("schooner"), as shown in the figure. These hooks are also useful in grasping and holding the syringe firmly while in use. Fig. 1 is a full-size sectional view of a two-ounce syringe of this kind, showing the relation of the various parts; Fig. 2, that of the nozzle; Fig. 3, the bottom view of the nozzle extremity of the syringe barrel; Fig. 4, a modification of the lower half of the syringe barrel.

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* *Independent Practitioner*, October, 1885, p. 509.

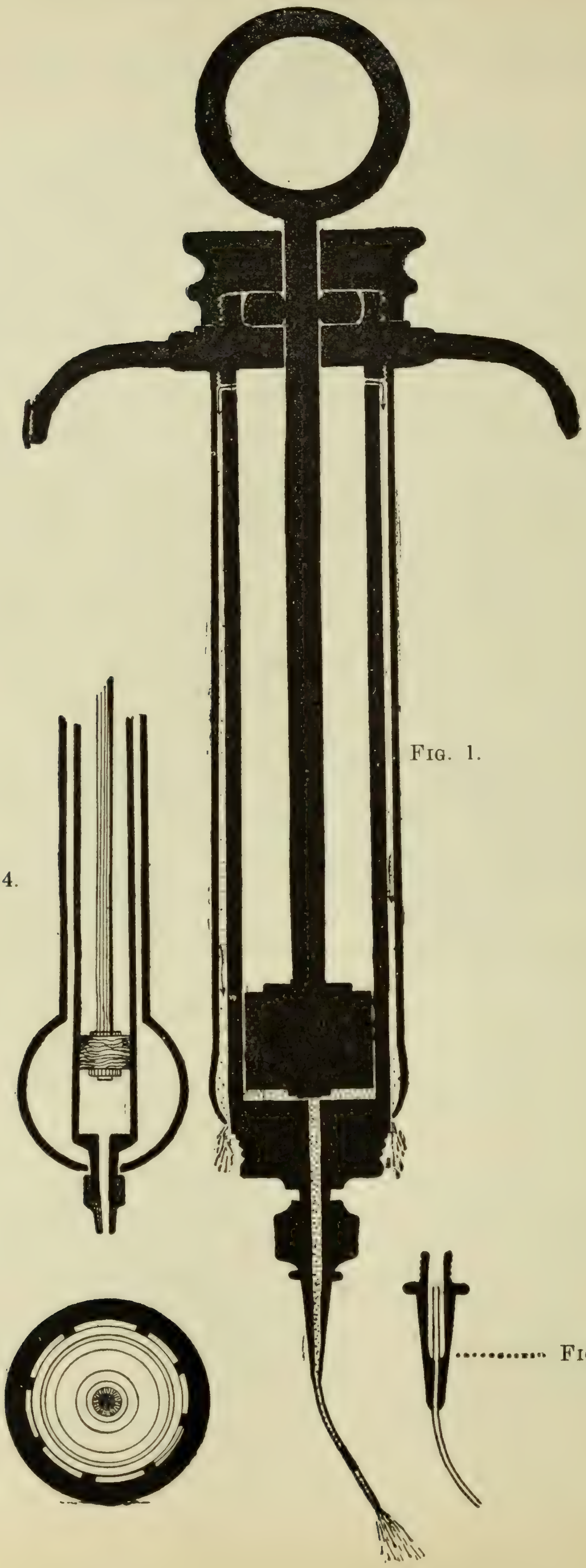


FIG. 1.

FIG. 4.

FIG. 2.

FIG. 3.

The syringe consists of an inner barrel and an outer barrel screwed together at the handle extremity, a piston, and a nozzle. The outer barrel and the piston-rod are of hard rubber, but the inner barrel, the hub, and the nozzle are of metal. If the inner barrel be made of hard rubber, the instrument would be lighter, but the play of the piston would be irregular and difficult to manipulate with delicacy: the inner barrel of the best syringes therefore is made of metal.

The object of the two barrels concentrically arranged is to prevent water from dropping on the clothing of the patient, when treating teeth of the upper jaw. This dropping is always liable to occur in the use of other syringes, owing to the regurgitation of the water backward past the packing of the piston while forcibly driving water out of the delicate nozzle. In this instrument, the water escapes from the inner barrel to the outer chamber through holes made close up under the cap of the syringe, as shown by arrows in Fig. 1. To prevent the water from dripping through the piston-rod hole in the cap, the cap is made double; between the duplicates is interposed a block of elastic rubber packing, which when the two caps are screwed firmly together compresses it, thus closing tightly round the piston-rod. To empty the outer water-chamber of its contents, the nozzle end of the syringe is held downward, or hung in an empty tumbler.

Whoever tries a syringe of this kind will soon understand why the toy syringes found in the market at the present day are unscientific in every way.

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

THE New York Odontological Society held its regular meeting, Tuesday evening, March 13, 1888, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street.

The president, Dr. J. Morgan Howe, in the chair.

The President. Before we enter upon the regular order this evening, I will state that the Odontological Society of France has extended a compliment to us by entertaining our ex-president at dinner. I have here the invitation that was extended to Dr. Bogue as the president of the Odontological Society of New York, and the *menu*. Will Dr. Bogue have the kindness to tell us something about the festivities of that evening?

Dr. E. A. Bogue. The president of the Odontological Society of France invited me, in the name of that society, to attend, as president of the Odontological Society of New York, a dinner, the prime object of which was to draw closer the scientific and fraternal bonds of the two associations. The dinner was given on the 15th day of December, 1887, at Marguery's. The after-dinner speeches were published in the magazine which is the organ of that society. The president of the Odontological Society of France commented upon the close bonds of relationship which existed between the two societies, and upon their pleasure in being able to acknowledge in that sort of way the bonds of co-fraternity which existed; that it was by these means that they learned of one another and were able to advance their professional interests. Dr. Saussine then made his remarks. I replied mainly that nine years ago it was said to be impossible for any dentist to obtain access to the laboratory or working rooms of any other dentist in France; and that to-day I have to acknowledge that I have obtained admission to the cabinets of a great many of the first dentists of France, and if they had any secrets I would have been able to explore them. Answer was made that if that was the case it was due to the open manner in which we Americans treated our French confrères in permitting them to see all that we did, and they could do no less than return the compliment. I thought it proper, having accepted the invitation as president of this society, to notify you of the compliment which they had paid to us, and which I, as your representative, accepted in your name.

Dr. S. G. Perry. And which we certainly should acknowledge in a proper manner.

The President. I am sure it will give us great pleasure to acknowledge such a compliment extended by that society. If any of the gentlemen have any motion to offer I will be glad to receive it.

Dr. Lord moved that the president appoint a committee of three, to consist of Drs. Perry, Woodward, and Howe, to prepare and transmit to the Odontological Society of France a suitable acknowledgment of the compliment they had paid to this society. The motion prevailed.

The President. I have here a communication from Dr. William Herbert Rollins, together with a bottle containing a tooth in hydrogen dioxide. The secretary will please read.

The secretary then read the following communication from William Herbert Rollins, M.D., D.M.D., of Boston, Mass., entitled

Effect of the Ordinary Solution of Hydrogen Dioxide on the Teeth.

This preparation is in such extensive use in dentistry that a word of caution may be of value. I purchased a solution of a reliable apothecary in order to have a fair sample, and into an ounce of it I put a tooth, which after a few hours (four) began to show marked signs of being acted on. The enamel had lost its lustre entirely. In two days the whole tooth became so elastic that it would bend in the fingers, and I could and have used this method of preparing teeth to be cut in a section machine. I send for the inspection of those members of the society who have recommended hydrogen dioxide a tooth which has been in the ordinary commercial solution of this agent for two weeks.

Dr. Bogue. At the conclusion of the dinner which has just been spoken of there was a little extemporaneous discussion, and I invited those gentlemen who were present to contribute subjects of interest or value of which they might become possessed to be read at our society meetings. During the next week or so came the little article which is here translated. The writer is a very modest and unassuming gentleman, who has taken some pains to study up practical chemistry. He handed this to me saying he was very glad to be able to offer a little communication, which he hoped we might consider worthy of being read before this society, and that it might be beneficial.

Dr. Bogue read the communication by Mr. Vital Anjubault, clinical professor in the Paris Dental School, entitled

An Improvised Vulcanizer.

A lady came to me recently with a broken plate. She was obliged to appear the following day at a reunion, and begged me to get her out of the difficulty. There was but one thing to do, and that was to make a new plate, and I set about it at once. The following day, at eight o'clock, the plate was in the vulcanizer, and the thermometer was on the point of marking 160° C., when I heard a horrible hissing and saw that a crack had appeared in the bottom of my apparatus. My patient was expected at eleven o'clock, and the day before I had even taken out a tooth, which now made it indispensable for her to wear a plate.

Suddenly an idea came to me. I placed the flask, which I had taken out of the vulcanizer, in a narrow saucepan, which I filled with glycerin; then I put the whole on to heat after having made

a sort of pasteboard cover, in which I had made three holes,—one for the handle of the saucepan, another for the screw of the flask which stuck out, and the third for the thermometer.

I adapted the cover and waited. At the end of twenty or thirty minutes, which appeared hours to me, I had the pleasure of seeing the thermometer mark 160° C. (320° F.). The rest of the operation went on perfectly, and aside from a white vapor, which was only slight and gave off a not very disagreeable odor, I find this mode of vulcanization more practical than our steam-chests, and absolutely without danger.

I must add that, after an hour and ten minutes, when I took out my flask, it was absolutely clean, which seems to me may be worth something to dentists who do their own laboratory work. Besides, my plate was admirably vulcanized, my patient perfectly satisfied, and gave me her warmest thanks.

I advise my confrères to try this means, which is very simple, cheap, and not at all dangerous. It can be done anywhere, even in traveling; for one can find a saucepan, glycerin, and pasteboard anywhere, and it may happen, as in my case, that it may be of great service some day. As for myself, I intend to make a series of experiments in vulcanization with our steam apparatus, and by my process. If the result is, as I believe it will be, in favor of the latter, I shall endeavor to make it the subject of another communication.

The President. Gentlemen, I am sure we all appreciate not only the spirit in which this communication has been made, but the value of the communication itself. The possibilities that are opened to the profession in the suggestions that we have here from this French brother are incalculable, and I am sure you all appreciate as I do their value, and the kindness of the writer.

Dr. John B. Rich. Mr. President, although it is a long time since I have had anything to do with practical mechanics, this communication seems to me to be one of the most important that was ever placed before this society. To think that all the expensive apparatus, all the steam-chests and the other inventions, of which there are so many heralded at every dental depot, are by this method rendered entirely useless, and that nothing but a simple saucepan, some glycerin, and the proper degree of heat are necessary for vulcanizing our rubber plates; making this operation, which has been difficult and dangerous with the complicated apparatus that has been used, so simple and safe that a child might perform it!

The fact that vulcanizing can be done in that way is a discovery that would probably entitle that man to a patent in every nation in

the world; yet here it is presented to us free. It is one of the greatest advances in mechanical dentistry that I have ever heard of. I think this gentleman deserves the most earnest and marked thanks of this society, which we regard as the first dental society of the United States, for his very liberal donation to dental science, and I move you that a committee of five be appointed to take this matter into consideration and address a proper communication to him in acknowledgment of his great liberality in making this donation to the profession and to the world.

Dr. J. Bond Littig. While I appreciate the advantage which this gentleman has given us, yet it seems to me that both oil and glycerin have been used heretofore for this purpose, but my impression is that it has taken a much longer time to vulcanize with those agents than is stated in the paper, and his method of covering over is different from what we have had before. I will not be sure of this, gentlemen, but as I look over the matter it seems to me that this is not the first time that I have heard it. At the same time I think the motion should prevail, and that we should give credit to the gentleman who has given us this method of doing it in such a short time.

The motion was adopted unanimously, and the president appointed Drs. Kingsley, Littig, Northrop, Carr, and Bronson as the committee.

The President. Dr. Perry has consented to favor us with a few thoughts on pivot teeth, and we will be pleased to hear him now.

Dr. J. G. Perry. Scientists depend upon nature for their facts; artists get their inspiration from nature. I am not so sure that dentists in years gone by have always received their inspiration from nature; I fear not, in view of many of the approximal operations that we have all seen in which the shapes of the teeth have been so destroyed. I also fear that they have not followed nature very closely in some of their operations in the matter of pivot teeth. In going over the literature of the subject, which is prolific in descriptions of different kinds of operations, I have failed to see the full regard that ought to be paid to the natural form and outline of the tooth. I am not aware that there is any porcelain tooth on the market that is constructed as it seems to me a pivot tooth should be, in order to carry out the idea that nature is the best possible guide for us to follow in all operations for the restoration of the natural teeth. No pivot tooth that I am familiar with is constructed with strict regard for what you might call the gum outline, or the natural outline of the enamel and the attachment of the gum to the root. I have here a natural central tooth-

crown, the root of which was used for an implantation case. With such a tooth, if you were to sever the crown from the root by cutting with a fine saw along the junction of the enamel, the base of the crown would be concave, or just the opposite of the base of the old-fashioned pivot tooth as generally made. The end of the root would be highest at its centre and the crown would rest on it like a saddle, rendering rotation impossible. It would also rest on the root in such a manner as to give the greatest resistance against the force of the articulating teeth. By reference to these crude drawings you will perhaps more readily understand my meaning.

For many years, in cases where it has seemed desirable to set a crown in a simple and rapid manner, I have been in the habit of remodeling as well as I could an Ash or a White old-fashioned wood pivot tooth; grinding the base as nearly as I could (see Fig. 1) to the form of the natural tooth here shown. Having then prepared my root by cutting it down to the gum, I fit the base of the crown to it as carefully as possible. I then fit a platinum and iridium pivot so that the crown and root can be joined accurately. I then set the pivot permanently into the root with the oxyphosphate, using the crown to guide it to its proper place. (See Fig. 2.) Then I remove the crown and cutting out the cement a little way down in the root and "reaming" the root out to the edge of the enamel, I pack gold around the pivot and over the whole of the end of the tooth. The gold is then finished and burnished to the edge of the enamel. The base of the tooth is then carefully refitted to the gold "washer,"—for that is what the gold filling really is,—and the hole in the tooth being filled with oxyphosphate, the tooth is set to its place before the cement commences to crystallize. If the root is one that has the marks of an old abscess, I set a split pivot and cylinder in the root and fill around it and over the end of the root with gold in the same manner. I then withdraw the pivot and finish off the end of the root and the cylinder, and then fit the tooth and set the pivot as before described. I then spring open the end of the split pivot, and fitting over it and on the base of the tooth the very thinnest wafer of gutta-percha, I warm the tooth and set it to its place. The spring of the pivot holds the tooth to its place, and the very thin wafer or "washer" of gutta-percha insures a tight, clean joint. Of course this is all done in order to allow easy removal of the crown and access to the end of the root in case of threatened abscess.

Fig. 1.

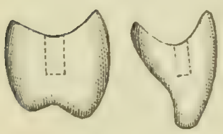
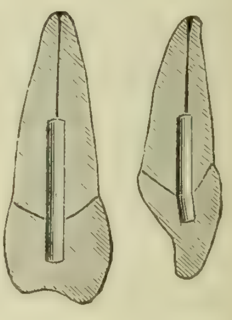


Fig. 2.



It seems to me that the first consideration in setting a pivot tooth is the permanent preservation of the root, and the next is to see to it that the crown shall be the weakest part of the whole structure, so that if a break occurs the root will be saved. With a firm, strong, and well-preserved root, I prefer to set my pivot—or my cylinder and pivot, as the case may be—firmly in the root as you would set a hitching-post into the ground. The adjustment of the crown then becomes a matter of secondary importance. Sometimes if the bite is so close that I cannot get the strength I desire by the use of the porcelain crown I have described, I fit a cylinder over the projecting pivot (which sometimes can be bent forward to gain room), and a thin sheet of platinum on the end of the root, and fit and solder a plate tooth to the cap and cylinder, and then set it on the pivot with oxyphosphate in the usual way. But generally in such cases I set a cylinder in the root and fit and solder a plate tooth to the pivot in the usual way.

The use of an old-fashioned wood pivot tooth, as I have described, is a most simple and expeditious way of securing a permanent operation in very many cases. It is a method that makes but little demand upon the laboratory, and one that can generally be completed at a single sitting. It involves no disturbance of the gum and paring away of the enamel as in setting a collar, and it leaves no vulnerable point where decay may commence upon the root. By this I do not mean to condemn the setting of a cap and collar. With badly-decayed roots this may be the only way in which a crown may be set so that the root will not split and the crown be securely held.

It seems to me that in office practice there is a place for such a porcelain crown as I have described, and it is a matter of surprise to me that such a crown has never been brought out by our manufacturers. In a recent number of the DENTAL COSMOS Dr. W. Storer How described a crown constructed on about the same plan, but with the disadvantage as it seems to me of having the pivot baked into the crown. I much prefer to be rid of the pivot while fitting the crown, and I have never seen a case where the oxyphosphate did not hold the crown to the pivot. In fact, it is impossible to get the pivot out without breaking the crown, if only reasonable care is used in setting it. I have many times set bicuspids in the same manner, using the Ash tube teeth. The fault with them, however, is that the holes are too small—even after drilling out the platinum tubes. The Bonwill crowns are the other extreme; the holes are so large that the crowns have not enough strength, and they are such crude and formless masses of porcelain that there is little satisfaction in using them. If bicuspids modeled after the natural teeth

and constructed on the plan shown by the drawing could be manufactured, I think they would fill a need sometimes felt in daily practice.

Dr. Rich. There is no doubt that the crowns presented by Dr. Perry to-night are a great advance upon the ordinary tooth-crowns for pivoting. Some years ago I was so well convinced of that being the proper method of setting such teeth that I had a long conversation with Dr. S. S. White about it, and tried to get him to make teeth of that form. You will find that the mechanical conditions produced by joining the root and the crown together with the crown cut concave gives the greatest amount of strength possible, follows exactly the line of the natural enamel of the tooth, and in many cases avoids the disagreeable black mark that results from setting the crowns as they are now made. Dr. White's answer to my request was that, while it looked to be the proper mechanical condition, he did not believe anybody would adopt it or buy the teeth if they were made, because dentists were wedded to the old method, and files had been constructed to form the groove in that way; so that my reasoning to convince him failed entirely so far as practical results were concerned. If such crowns could be manufactured for us it would be a great advance.

Dr. Littig. Will Dr. Perry please tell us how he forms the end of the root?

Dr. Perry. I cut the root to the outline of the gum, following as nearly as possible the line of the enamel; I then grind the crown to that, making the tooth subservient to the root.

Dr. Littig. You make the root convex and the crown concave?

Dr. Perry. Certainly.

Dr. Littig. You do not trust to any intervening substance in the cavity between the tooth and the crown?

Dr. Perry. No. I grind the root to the crown and fit it as closely as possible. With a trained eye and a careful hand you can make a close fit with no intervening substance at all.

Dr. Littig. I thought you had perhaps some special method of shaping the root, or some special instrument.

Dr. Perry. No, sir.

The President. Gentlemen, it affords me great pleasure to introduce to you George A. Maxfield, D.D.S., of Holyoke, Mass., who comes a long distance to present to us a paper he has prepared, entitled

Notes on Alveolar Abscess.

Dr. Maxfield. Mr. President, and Gentlemen of the Odontological Society: I wish to return to you my thanks for the honor conferred

upon me in inviting me to read a paper before you. I am only sorry that I have not been able to prepare a better one, and it is with many misgivings that I proceed. I wish to say that I am indebted to Dr. Barrett, editor of the *Independent Practitioner*, for the loan of the drawings from which most of these diagrams were made.

During the past few years much has been written on the subject of alveolar abscess, and in dental societies it has been a prominent theme of discussion, thus adding much to our knowledge of its etiology, pathology, and treatment. The most valuable treatise on this subject which has been added to our literature was written by Dr. G. V. Black, and published in the first volume of "The American System of Dentistry."

Many in our profession, however, have not yet opened their minds to receive the light, now so free to all, and fail to differentiate in their diagnosis and treatment, so are obliged to record most of these cases as not amenable to treatment.

Talking on this subject with a professional friend a short time since, he remarked, "I hate alveolar abscesses worse than poison." Though an inelegant expression, it was full of meaning. That many have this same opinion is probably owing to the fact that the trouble ceases many times with the extraction of the tooth, and this being an easy way out of the difficulty, the forceps are often resorted to.

In the treatment of these cases the maxim holds good, as in other things, that to achieve success one must believe that the necessary facilities are at his command.

Another erroneous opinion, quite prevalent throughout the profession, is that an alveolar abscess may occur on a tooth having a living pulp. This is evidenced by occasional reports of such cases published in the journals. To refute this opinion, and show how such erroneous ideas may originate from a wrong diagnosis, will be the object of this paper.

A writer in one of the recent numbers of the *Popular Science Monthly* makes this statement: "Everywhere in science experiment is worth more than observation; it is said that the evidence in pathology is so contradictory that almost anything can be proved by clinical cases." In the cases under consideration, if we are careful, in making our diagnosis, to consider all the facts as they *are*, and not as they *appear*, we shall not be guilty of reporting as remarkable cases of alveolar abscess on a tooth having a living pulp.

In the first place, we understand an alveolar abscess to be one that always has its origin at the apex of the root of a tooth, or, as Black terms it, in the apical space. Wherever an abscess forms, more or less destruction of the parts is involved. It must be ap-

parent, therefore, that when an abscess involves the apex of the root, the vessels entering the root must have been destroyed in the early stages of its formation; so then, we may truly say, *there cannot be a case of alveolar abscess on the root of a tooth which has a living pulp.* There are abscesses originating on or within the alveolus, which may even involve some other part of the root of a tooth, but they are not alveolar abscesses. As these arise from different causes, and as the symptoms frequently resemble those of alveolar abscess, we will briefly consider them.

First, Inflammation of the Periosteum.—In this connection I use the word inflammation to indicate the pathological expression thus termed when we see it in the external soft tissues, and I will not attempt the discussion of inflammation in this paper. Inflammation of the periosteum is often caused by external violence, or by exposure to cold, while constitutional lesions such as a syphilitic or scrofulous taint, rheumatism, and defective nutrition, are quite frequently predisposing causes. This inflammation is known according to its extent as periostitis, diffuse periostitis, or sub-periosteal inflammation, and may be acute or chronic.

Acute periostitis is generally attended by severe constitutional disturbances; the periosteum becomes thickened by the active congestion, followed by an increase in size of the capillary vessels or vascular spaces. There is intense pain and extreme tenderness; the surrounding soft tissues become swollen, the skin red and edematous. "The primary symptom is increase in the size (and perhaps number) of the capillary vessels or vascular spaces, and effusion of blood or lymph. The first change is enlargement of the vessels which run in the Haversian canals, followed by the absorption of the bony tissue which joins the enlarged vessels. . . . Into the spaces thus hollowed out in the substance of the bone or on the surface, by the removal of the earthy matter, the products of inflammation are next secreted. These secretions vary according to the nature of the injury, or other causes of the inflammation, as the activity of the process, the constitutional conditions, and many others, so the products of inflammation are divisible into two principal varieties corresponding to the plastic and aplastic lymph met with in other parts, and leading, the former to the deposition of earthy matter and the formation of new bone, and the latter to suppuration. The former result terminates in hardening, or sclerosis, as it is termed; the latter in a variety of conditions. When the suppuration is limited within a cavity in the cancellous tissue, or in the compact tissue rarefied by previous inflammation, circumscribed abscess is produced; if the membrane lining the medullary cavity and cancelli is involved and pus extends along the inner side of these mem-

branes, we have the condition of bone known as 'osteo-myelitis'; suppuration between the periosteum and bone forms periosteal abscess. Any of these forms of suppuration, when accompanied by the insensible exfoliation of the bone (or its death and removal in invisible portions), constitutes ulceration of the bone or *caries*. The symptoms of periostitis as well as the morbid anatomy are the same as when there are inflammatory deposits in the deeper parts of the bone, save that in periostitis the thickening and vascularity involves no other part of the nutrient membrane of the bone except the periosteum, and the inflammatory deposit is confined to the surface of the bone, between it and the periosteum." *

The study of periostitis pure and simple is extremely difficult, as it seldom occurs without the inflammation extending to and involving other parts of the bone. Very few preparations of pure periostitis are in the museums, as it is seldom met, save in a complicated state, in post-mortem examinations.

When the inflammation of the periosteum is acute, suppuration takes place in the course of two or three days, and then the membrane becomes detached from the subjacent bone. When chronic a hard, flat, circumscribed tumor (a node) forms, with a deposit of plastic material in the periosteum and neighboring parts. When these nodes form on flat bones, such as the cranium, they speedily suppurate; when on the long bones suppuration is exceedingly rare.

Acute inflammation between the periosteum and bone is known as "diffuse periostitis," or sub-periosteal inflammation. It is a disease of frequent occurrence, commonly at the age of puberty, and seen more frequently in boys than in girls. "It commences generally with an injury of more or less severity, and the symptoms which immediately follow the injury are usually so slight that even the accident itself is perhaps forgotten. After a varying lapse of time, probably four or five days, symptoms appear which at first are almost invariably attributed to diffuse cellular inflammation or to rheumatism,—viz., rigors, pain in the part, and an edematous angry swelling. When this disease occurs on the long bones and is allowed to go on unchecked, the suffering is very intense. Pyemia is very likely to occur, resulting many times in death, while the violence of the action and the profuse suppuration cause death in some cases." †

The formation of pus between the periosteum and bone, causing a separation or denudation, is the most common cause of superficial necrosis in bones. The bones of the head and face are an exception to this rule, for here are sometimes large separations; or extensive

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* Holmes's Surgery, vol. iii, page 121.

† Ibid., page 127.

destruction of the periosteum may occur without causing the death of the bone. This is accounted for by the peculiar circulation in the bones of the former and by the great vascularity of all the parts in the region of the latter. When this disease does attack the maxillary bones, it is very liable to be mistaken for alveolar abscess.

In the treatise alluded to by Dr. Black, he cites a case which came under his notice in its early stages, when the patient refused to have anything done. When he next saw the case, a few days later, there was an extensive necrosis that carried away four teeth with a considerable piece of the superior maxillary, laying open the antrum of Highmore. The discharge of pus was at the free margin of the gum. He further says, "Sub-periosteal inflammation occurring under the temporal muscle, especially if it be in the temporal fossa, will usually discharge its pus into the mouth near the last molar of the upper jaw, or it will appear on the face from under the zygomatic arch; and if the case be somewhat chronic, it may be mistaken for alveolar abscess. The temporal muscle is covered by a very deep fascia, which prevents the pus from coming to the surface, and the fibers of the muscle will carry it in the direction indicated."

A chronic case of periostitis, occurring on or just above the alveolus, if first seen when in this stage, and the pus discharging at the necks of the teeth, is liable, on superficial examination, to be mistaken for what is commonly termed "pyorrhea alveolaris," but as Black more fitly terms it, "calcic inflammation of the peridental membrane and gums." I made this mistake in diagnosis in one instance, and treated the tooth, a superior second bicuspid, over two weeks before recognizing the true state of affairs. As a rule, on closer examination, we will find a tenderness to pressure on the outside of the face above the alveolus, which symptom is not liable to occur in the disease just noted.

The treatment of periostitis* varies according to the stage. If seen in the early stages a counter-irritant is indicated, such as painting the tincture of iodine over the part; if there is swelling, depletion is indicated, either by leeches or by lancing. If there is much pain, it is probably caused by the tension of the membrane over the bone; a free incision down to the bone will give almost immediate relief, by relaxing the tension. Often this is all the treatment necessary. If pus has formed, a free opening must be made, the parts thoroughly cleansed and made aseptic.

Periostitis is sometimes the cause of alveolar abscess. Commencing on or just above the alveolus, the inflammation extends to and involves the peridental membrane. "The congestion and

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*I refer here to periostitis on or just above the alveolus.

swelling of this membrane causes a stricture of the vessels entering the apical foramen of the tooth, and thus literally strangulates the pulp to death." Alveolar abscess is then sure to follow, and, in addition to the sub-periosteal inflammation, produces a complicated condition that, if not amenable to treatment, will compel the tooth to be sacrificed. We have illustrations of an alveolar abscess associated with periostitis on the alveolus. This condition of affairs may be the result of periostitis, or it may be the result of the alveolar abscess. When from the latter cause, it must have been a case in which the inflammation has run high, and involved the bone-substance itself, so that we have a pus-forming surface on both sides of the bone. If the parts are allowed to remain in this condition very long, necrosis of the alveolar plates will result to a greater or less extent. If the pus is promptly evacuated, the inflammation controlled, and the periosteum brought in contact with the parts from which it was separated, it will become reattached and the parts will readily heal. When this occurs on the palate the danger of necrosis is less, as the palate bone is thin and its supply of nourishment from the periosteum on the nasal side remains intact. When this occurs on the lower jaw, it is very liable to discharge on the face.

Second, Calcic Inflammation of the Peridental Membrane and Gums.—This will sometimes cause an abscess that may be mistaken for alveolar abscess. This I can best illustrate by two cases presented by the same individual that came under my observation. One evening a few years ago a young man of about thirty came to my office to have a tooth extracted. The right side of the lower jaw was very much swollen; the second bicuspid was somewhat loosened, though the tooth was perfectly sound. As the patient was positive he had not received any injury, I could not understand the condition, and as he was suffering intense pain I extracted the tooth. Examining it afterwards, I found a slight deposit of serumal calculus on the buccal side of the root, about one-fourth of an inch below the margin of the alveolus. On breaking open the tooth I found the pulp must have been alive when it was extracted. It was then evident that the calculus was the cause of the inflammation, and I was quite chagrined that I had not been able to understand so simple a case. Six months afterwards he again came in, remarking that he should need to have another tooth out. On examination I found on the lingual side of the alveolus, opposite the left inferior central, a swelling the size of a large pea like the pointing of an alveolar abscess, and the tooth somewhat loose. Remembering the tooth I had extracted for him, I explained the condition, and persuaded him to allow me to treat the tooth. With a bistoury

I cut into the swelling, down to the tooth; there was a slight discharge of pus and some hemorrhage. I then passed a Riggs scaler down beside the root, removing a slight deposit of calculus; then made an application of aromatic sulphuric acid, followed by carbolic acid and glycerin,—one part of the former to two of the latter,—and dismissed the patient. When I saw the case four days later I found the gum entirely healed, and the tooth quite firm. About two years afterward this same tooth was again affected in like manner, though not so severely. I simply removed the calculus and treated as before, when it healed as readily.

Third, Impacted Teeth.—These are sometimes the cause of an abscess within the alveolus, and if on the lower maxilla often discharge on the outside of the face. A careful examination of the mouth will generally reveal the cause. The only remedy is extraction, though this may prove a difficult surgical operation.

Mistakes in diagnosis are often the cause of serious results. To diagnose a case correctly, and learn the cause of the abscess and where it is located, is many times a difficulty not easily overcome. An abscess seeming to be located on the root of a tooth in which there is a living pulp must arise from one of the three causes already mentioned, or it is an alveolar abscess located on the root of some other tooth. A few cases will illustrate these points.

Case 1. An acute alveolar abscess; the patient, a lady of about thirty years, of a nervo-bilious temperament, had been slightly troubled with malaria for several months. The first symptom of dental trouble was severe pain in all the teeth on the right side of the superior maxilla. This increased until she was so exhausted as to be obliged to keep her bed for five days. The physician in attendance would not extract any of the teeth, as the pain could not be located in any particular one. On the fourth day the roof of the mouth back of the incisors became very much swollen; the next morning an abscess pointed and broke, when the pain gradually subsided. As soon as the patient was able—in about two weeks—she came to me very confident the central tooth was the cause of the abscess. In this tooth there was a large approximal gold filling. On examination I found the fistula had closed up; the tooth was somewhat tender on percussion, and appeared darker than its mate. I at once decided that the patient was right in locating the trouble, and commenced to drill into the palatine surface, to open the pulp-chamber. As soon, however, as I reached the dentine I found it in a hypersensitive condition. Concluding my diagnosis was wrong, I began an examination of the other teeth. None were tender on percussion, nor gave any indication of trouble. As there was a large approximal cement filling in the second bicuspid I

decided to cut it out, and on doing so the mystery was revealed: the pulp was putrid. In treating this case the canals and cavity were filled at that sitting, taking about two hours. About a year afterwards, on replacing the gold filling in the incisor, I was surprised to find the pulp dead, as there had not been any pain or soreness in the teeth since the bicuspid was filled. In this case the abscess on the bicuspid must have formed high up in the alveolus, causing pressure on the nerve-trunk, thus producing the sensation of pain in all the teeth; the pus then burrowed along through the cancellous portion of the bone till it reached the anterior palatal canal, when it dropped down through the incisor foramen. The swelling of the tissues about the incisor produced irritation of the peridental membrane, which, extending to the pulp, caused the hypersensitive dentine. The result of this irritation was the death of the pulp.

Case 2. A chronic alveolar abscess of three years' standing; patient a gentleman, healthy, aged thirty-five. Examination revealed a swelling the size of a pea—pointed and about ready to discharge—directly opposite the palatal root of the second molar on the right side. Some three years before, large approximal amalgam fillings were placed in the distal surface of the first molar and mesial surface of the second molar. All of his teeth had been separated according to the Arthur method, and these fillings were not contoured, but shaped like the other separations. The abscess dated from the time these fillings were inserted. At frequent intervals the swelling would appear, causing considerable discomfort, which was relieved when the abscess broke. The second molar was quite loose and tender on percussion; the first molar not tender on percussion. I diagnosed the abscess to be on the palatal root of the second molar, and removed the filling from that tooth. As I opened into the pulp-chamber the escaping gas was an assurance that my diagnosis was correct. On attempting to remove the pulp I was astonished to find only about one-third of it was destroyed, the remainder being in a life-like condition. I was now in a quandary, and began to think I had a genuine case of alveolar abscess on a tooth with a living pulp. Arsenic was applied, and two days afterward I was able to remove the pulp from the three canals. A drill was then passed through the apex of the palatal root, and the medicines forced through and out at the fistula. As the case had been of so long standing, the canals were packed with cotton saturated with eucalyptol and iodoform. At the next appointment, seven days afterward, as pus was being discharged at the fistula, a few drops of cocaïne were injected; the fistula was enlarged, and an engine bur passed around the end of the root. After thoroughly

washing out the parts with peroxide of hydrogen, an application of eucalyptol and iodoform was made, without disturbing the dressings in the roots. At the end of another week, as the pus continued to be discharged, I removed the filling in the anterior tooth and found a dead pulp. There was a large opening in the apex of the palatal root, so that everything injected into this root immediately passed out at the fistula. The roots of this tooth were then packed the same as the former tooth. At the next appointment, a week later, the fistula was healed, and the second molar was firmer in its socket. The dressings were then removed from the canals, and without further treatment the roots and cavities were filled. The cutting away of the crown to make the separations brought the filling too near the pulp, causing the death of the pulp and the resulting abscess. The continual closing of the fistula and the consequent swelling produced an irritation of the peridental membrane of the root of the second molar which was strangulating the pulp, so that in a short time it would have been entirely destroyed, and probably would have caused a violent outbreak.

Case 3. The patient was a gentleman of about thirty; healthy but not robust. I first saw the case in the evening, the pain having commenced in the superior left second bicuspid about the middle of the forenoon, and continued with increasing severity. The roots had been treated and filled two years previous by a neighboring practitioner, but the tooth had been tender and sore ever since. I diagnosed this as a case of chronic pericementitis assuming the acute form. The filling was removed, and I tried to open up the canals, but as the drill was obstructed by gold I gave up the attempt. I scarified the gum over the root, cutting down to the bone; applied a mixture of aconite, chloroform, and iodine,—giving some relief,—and dismissed the patient. The next morning he returned, not having slept through the night. I made another attempt to open the canals, and having removed a small piece of gold, found a pledget of cotton had been packed into the canals. One canal was obstructed so that I could not pass the broach; the other was open. This I washed out, and applied a capsicum plaster to the gum, hoping it would soon give relief, and dismissed him till evening. At noon he came in; pain still severe. I then passed the drill, as I supposed, through the apex of the canal that was open, also from the outside of the gum through to the apex, and requested him to call in the evening if the pain still continued. When he then returned the pain was increasing, so with the prospect of another sleepless night before him I yielded to his entreaties, and extracted the tooth. I then found this condition: a quarter of an inch from the apex, the root curved. There was an abscess-sac

half the size of a pea on the end of the root. About half-way up the canal on the buccal side of the root there was a broken broach about three-eighths of an inch long, with the débris of the pulp above it; this part of the root had turned very black, and was denuded of the membrane. My drill, instead of passing through the apex, had passed out at the side where the root curved, and so had not reached the abscess. This was a case of blind abscess that had been sleeping for two years, which, with all the attendant conditions, in most cases would have at once resulted in an acute alveolar abscess. Under the circumstances extraction proved to be the best treatment. In reaching this conclusion I do not consider the accidental passing of the drill through the side of the root as of any serious import, or that it added to the complications already existing. The grave significance of the case was in allowing the broken broach to remain in the canal while the septic material had not been removed. Such practice as this I cannot deprecate too earnestly. In a number of cases where broken instruments have been left in the canals I have observed, after extraction, this same condition,—viz., that portion of the root being entirely denuded. When such an accident does occur, every effort should be made to dislodge the broken instrument, and if this fails the patient should be informed of the accident, and a temporary filling placed in the cavity. In the case just cited, if the patient had known and informed me of the broken broach in the root, I could have so treated the case as to have preserved the tooth.

Against the above method of filling root-canals I *also* want to utter my protest. Words fail to express the condemnation it deserves. *It is gross malpractice.* The cases that have been cited in this paper are exceptional ones. A majority of the cases presented are simply those of alveolar abscess uncomplicated and easily diagnosed, and, if properly treated, will very readily heal.

A few words in regard to the treatment of these cases. The experiments made during the past two years, by leading investigators of both the dental and medical professions, have demonstrated that *suppuration* is always caused by the presence of bacteria. A knowledge of this fact indicates the line along which our treatment must proceed. First, all broken-down and dead tissues must be removed; the parts must be cleansed and made thoroughly aseptic; then such remedies should be used as will incite a healthy action in the parts. Open up the parts sufficiently to gain free access to the canals. It is often better to sacrifice good tooth-structure in opening up the canals than to attempt to treat the canals by working around corners. We should bear in mind that a great many failures result from over-treatment and from using improper remedies.

Carbolic acid, full strength, should not be used in treating these cases, as it often causes more harm than good by its escharotic and coagulating properties. Wherever pus is being formed, there is the seat of war; the bacteria are trying to break down the tissues, and nature is trying to expel them and restore the injured parts. If carbolic acid is used, what is the result? The germs with which it comes in contact are destroyed, but it cannot reach those that have penetrated into the tissues, because by coagulating the albumen it forms an impenetrable barrier around them; and then the fight goes on with renewed vigor, the coagulum forming another obstruction that nature must remove.

The treatment required is to destroy and remove all the germs from the parts involved, and having accomplished this, to at once seal up the canals, thereby preventing the entrance of other germs. Nothing equals the peroxide of hydrogen for destroying the germs and cleansing the parts. Inject it into the canals before attempting to use a broach or any other instrument. After thoroughly removing the débris, wash out the canals and abscess-cavity with the peroxide, continuing its use till all bubbling ceases. To make assurance doubly sure, then wash out the parts with a 1 to 1000 solution of bichloride of mercury. Then, wiping out the canals, inject a saturated solution of iodoform in eucalyptol, taking pains, if there is a fistula, to pump it through the canals and abscess-cavity out at the fistula. The canals should then be filled at once, by pumping in a solution of gutta-percha and forcing a gutta-percha cone—which previously must have been fitted to the canals—to the apex. The cavity can now be filled at leisure. Very few cases require more treatment than this.

Another method has been advocated quite recently,—namely, using hot air to destroy the germs and to dry out the canals, and a number of ingenious implements have been invented for heating and applying the air. I question the utility of hot air in the canals as a germ-destroyer, for heat sufficient to destroy the germs will cause an irritation of the peridental membrane. Moreover, as eucalyptol is a solvent of gutta-percha, it is unnecessary to dry out the canals when this material is to be used for filling. So the application of hot air is not called for.

Discussion.

The President. Gentlemen, Dr. Maxfield's paper is before you for discussion.

Dr. Littig. One remark in the paper called to mind an incident which is rather opposed to the theory that has been stated here to-night, that no abscess occurs on a tooth that has not a devitalized

pulp. Up to the time that I speak of I had held the same theory; but about two years ago a lady presented herself for examination who had just above the second superior molar a small fistulous opening, which she stated had been treated for some time without result. It had been treated from the outside under the supposition that the alveolus had become carious, and yet after it healed up the abscess still remained. There was no inflammation apparent, and it seemed to be merely a small chronic abscess with an opening that discharged pus. I thought at once that the pulp must have become devitalized in the second molar, as that was the only tooth that had a cavity in it. In that tooth there had been a temporary filling of oxyphosphate, so I cut in boldly and took it out, but found the pulp very sensitive, and the patient rebelled against further progress in that direction. I then examined the wisdom tooth carefully to see if there could be any trouble there, but that seemed to be in a perfectly healthy condition, having no cavity whatever. I concluded that the best thing for me to do, as the pulp of the second molar was exposed and had evidently been capped, was to devitalize it, and I did so with an application of arsenic. After two or three days I removed the bulbous portion of the pulp, and also the pulp from the palatine root and from one of the buccal roots. I am not positive that there was any living pulp in the other buccal root. I proceeded to cleanse the pulp-cavity and canals as far as I could, and filled very carefully, and since that time there has been no further abscess. Exactly what caused that trouble I have never been able to understand, unless it was the death of the pulp in one of the roots which I failed to get anything out of.

Dr. Bogue. Theoretically I hold the same view precisely that has been expressed by Dr. Littig; practically I have in my hand four cases which are rather troublesome to reconcile with that view. The description of one of the cases I will read in the language of the unfortunate victim herself, as she wrote it to-day: "Left superior first bicuspid; abscess on one root, living pulp in the other; tooth sensitive to heat and cold; an abscess like a hazel-nut came over the end of the root; abscess treated for some time; roots finally filled with oxychloride of zinc. Pain continued to grow worse; oxychloride taken out and fragments of living pulp taken from the adjoining root-canal." Since the destruction of the pulp there has been no further trouble.

Another case was one already referred to in this society, where an abscess occurred on the palatal root of an upper right molar, which was eventually removed, and the pulp was found alive and afterwards taken out. Previous to that I had another case in which the palatal root died; abscess occurred, and the two buccal

roots were alive. I destroyed the pulp in both cases. The specimen in alcohol which I pass around was extracted for abscess that completely loosened the tooth and destroyed the sockets. It necessarily was alive when the tooth was taken out, as you see the pulp is all in the tooth still. The date of extraction is on the vial. I think it was a case of calcic abscess; but it presented all the appearance of alveolar abscess, and was one of those cases that would puzzle any of us to diagnose with absolute correctness.

It seems to me, therefore, that practically we must acknowledge that abscess can take place and the pulp be alive. I am not prepared to say more than this, for it has not yet been demonstrated that calcic deposit is not at the bottom of all the abscesses that have taken place here with the exception of the bicuspid spoken of.

Dr. S. E. Davenport. If this evening had not been so prolific in the appointment of special committees, it would be my pleasure to suggest that the president in some suitable way cause our thanks to be transmitted to the Connecticut Valley Dental Society for sending us their honorable secretary, who has this evening presented us so able a paper. The essay shows the result of much thought and care in its preparation, and the very successful treatment of the cases cited—many of which I am sure we would acknowledge to be quite puzzling—proves the eminent ability of the writer in the practical department of the profession. I think we must all agree with Dr. Maxfield in his premises, and even taking into consideration the remarks just made by other gentlemen, we must acknowledge that abscesses on teeth having living pulps only seem to be such until we have found the real cause, which is usually a portion of a dead pulp.

Teeth have one, two, or three roots, and the death of the pulp of one root, or even a portion thereof, is sufficient to cause an abscess, which may give the patient possessing that tooth a good deal of trouble. Our ex-president, who has just spoken of one or two cases in his practice, had an uncomfortable experience in his own mouth some years ago; and although the knowledge and skill of the one whom he called upon, as being nearest at hand, to help him out of the difficulty was not sufficient, he afterwards found that what he considered to be an abscess upon a tooth containing a living pulp was only a deposit of salivary calculus far down, and the effect of its removal was to assure him that he had not succeeded in finding a tooth with a living pulp and an alveolar abscess.

Dr. Bronson. With reference to the specimen that has been received this evening from Dr. Rollins in a solution of peroxide of hydrogen, in the treatment of teeth it has seemed to me to have no injurious effect. I cannot conceive that, in the way in which we

ordinarily use it, it would result in the destruction of tooth-salts at all. It brings to mind also the preparation which Dr. Herbst proposed for the relief of sensitive dentine, and which I believe has been demonstrated to be destructive to teeth *bottled in it*, but which, if carefully used, seems to be harmless. It certainly has the effect of relieving sensitiveness, and after a limited experience I have not had occasion to find fault with it.

Dr. Davenport. Peroxide of hydrogen is only another of those agents which may be said to be excellent servants but very bad masters. In commenting upon the specimen sent by Dr. Rollins, we must remember that it has been immersed in a bottle of peroxide of hydrogen for a long time. The acids found in much of the fruit we eat would make sorry work of a tooth subjected to their full strength for even a short period of time; yet some of us live and preserve the enamel of our teeth, though eating lemons, apples, etc.

Dr. Bogue. Having waited for the other gentlemen, I want to return to the charge. It seems to me that Dr. Maxfield has very nearly proven the position which I understood him to take; at least we cannot prove to the contrary. That position, if I understood him rightly, is this: that however much an abscess may seem to be alveolar abscess, unless the pulp be dead it is not such. It may closely simulate that, but there is invariably, according to his views, some other cause. I have taken the liberty of presenting here four apparently contradictory cases, but so far as possible I think the case is proven.

The President. It is a matter of definition and restriction of definition, is it not?

Dr. Bogue. So it seems. Dr. Maxfield would claim that the cases presented here to-night were not caused by dead pulps, but were calcic abscesses.

The President. Notwithstanding they were in the alveolus.

Dr. Bogue. Yes, sir.

Dr. Rich. In the four contradictory cases were not the pulps partially dead?

Dr. Bogue. The pulp of one that I passed around was quite alive. Two of the other three cases had dead pulps in the palatal root and living pulps in the buccal roots; the other case had a dead pulp in the buccal bifurcation of the bicuspid root, but a living one in the lingual.

Dr. Rich. Was the abscess at the point where the dead pulp was?

Dr. Bogue. It was.

Dr. Rich. That proves Dr. Maxfield's theory.

Dr. Bogue. That is what I thought.

Dr. Rich. How are you certain that the pulp was living in both roots of the specimen that is passing around?

Dr. Bogue. I examined it immediately, within ten minutes after extraction. It is pretty muddy now.

Dr. Rich. It is a pity that there had not been a microscopical examination in that case. Sometimes there is an appearance of very recent vitality, when really the pulps have been dead for a long time. By a microscopical examination you can determine that.

Dr. Bogue. A microscopical examination in this case was not at all necessary to determine it.

Dr. Maxfield. I think calcic inflammation caused the abscess. The calcic deposit may work down upon one of the roots of a bicuspid or molar; the resulting inflammation of the peridental membrane may cause strangulation of the vessels entering the root and finally cause death of the branch of the pulp that runs in that root. If we happen to examine the tooth at just that time we will find the appearance of an abscess on one root, and a living pulp in the other roots. If we should wait awhile we would in all probability find the pulp dead in all the roots. I think that in all these cases of abscess on a tooth having a living pulp, we will find, on close examination, that calcic or serumal deposit is the cause of the abscess. Abscesses resulting from calcic or serumal deposits require different treatment from those resulting from dead pulps. I do not think it has been taken into account that inflammation of the peridental membrane will cause death of the pulp. I had never seen that stated until I read my paper before the Vermont Dental Society a year ago.

A word upon the question of bacteria. It is now, I understand, in dispute whether bacteria are the cause of pus. In every case of pus we find bacteria, but the question of how bacteria get into an abscess such as a periosteal abscess the scientists have been unable to explain. Since I read Dr. Knapp's paper, a year ago last December, that question came to me at once. He said he had injected some pus-forming microbes into the ear of a rabbit, and upon afterwards breaking the bones of the rabbit's leg pus containing microbes immediately appeared where the bones were broken. Now, it has been proved that these same microbes found in pus are in the mouth and in the air. They are not always in the mouth, but they are liable to be there at one time or another. If that is the case there may be at times a certain condition of the system whereby those microbes may be taken into the lungs, and through them into the circulation; and if there be then some irritation or inflammation these microbes might be carried to that spot, and thus would be found in the pus-formation. That is the only theory that I can at present

accept as to the formation of pus in connection with the bacteria theory.

Dr. Perry. I have for a long time considered that the body is literally alive with bacteria; and when stagnation of the blood occurs, and wherever there is a moment's rest, they spring into existence. You may expect to find them after calcic inflammation; you may expect that after the death of the end of a root they will make their appearance immediately and push on as fast and as far as they can. If there be vitality enough in the root to resist them they may stop for a time, but they will surely make their appearance sooner or later; and when they get started they grow so rapidly that they carry everything before them. It seems worthy of belief that their germs are in the air we breathe, and everywhere in the body and about it, ready to manifest themselves whenever they get a chance, that they are parasites in every sense of the word. It is a case of the survival of the fittest, and if the man is the stronger he is all right, if not he must succumb.

Dr. Bogue. That is the very point from which I wanted to dissent. Dr. Maxfield said that bacteria were the cause. I should say not the cause; I consider them the scavengers to carry out the products. They are not there before the pus. It is the old question that we are discussing,—Is the egg first, or the hen?

I should like to second Dr. Davenport's motion that we extend our thanks to Dr. Maxfield for his very excellent and thoughtful paper on the subject that he has presented to us to-night.

The motion prevailed.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

ANNIVERSARY MEETING, FIRST DISTRICT DENTAL SOCIETY.

At the evening session of the nineteenth anniversary meeting of the First District Dental Society of the State of New York, January 18, 1888, Dr. J. Foster Flagg, of Philadelphia, read a paper entitled "It Has Occurred," being a reply to the editorial in the Dental Cosmos for August, 1887. Prefatory to reading the paper Dr. Flagg said, "I have been in correspondence since last summer with many of the most eminent medical men of this country, and have, as the result of this extended correspondence, scores of letters from them, from the extreme south to the extreme north and the extreme west. Although some of them express their kindly feelings toward a union between medicine and dentistry, or rather the adjunctive union of dentistry to medicine as a specialty, yet a large majority of them seem decidedly adverse to any association upon any other ground than that of the degree of M.D."

Dr. H. J. McKellops, who had acted as the supervisor of the clinics of the society during the anniversary meeting, expressed his thanks to operators, saying that he had witnessed the most beautiful practical bridge-work that he had ever had the pleasure of seeing, and expressed himself in complimentary terms of the clinics generally.

The president introduced William H. Atkinson, M.D., D.D.S., of New York, who, after some preliminary remarks, read a paper entitled

Studies in Pyorrhea Alveolaris.

It is a well-known fact that accumulation of calcareous deposits about the necks of teeth after recession of the gums is often followed by loss of gums and pericementum, proceeding towards the ends of the roots, and is the immediate antecedent of pyorrhea alveolaris, otherwise known as Riggs's disease. It is a mooted question whether the formation of calcareous deposits primarily leads to suppuration, or whether the recession of the gums is the first stage, nay the occult suppuration itself, by which the pockets are formed and the deposition of the calcareous matter and the suppuration subsequently occur.

My own conviction is that a lack of tone in the elements of tissue connecting the gums with the cementum leads to recession, and is the primary symptom, forming a gap in which calcareous matter is deposited, together with exuberant growths of fungus, known as leptothrix buccalis.

Whether suppuration must be present before deposition of lime-salts can only be settled by a study of proper microscopical specimens in the very earliest stage of the disease. The deposit was formerly called tartar, but is now known to be a deposit of lime-salts, phosphate of lime, with some carbonate of lime, entangled with leptothrix, a growth which is rather common around the teeth of almost every person. If a specimen be placed in a solution of chromic acid, the lime-salts will be dissolved, not only of the hard tissues of the tooth, such as dentine, enamel, and cementum, but also from the deposit erroneously called tartar; and ultimately under the microscope nothing will be seen but a heap of leptothrix, more or less firmly attached to the neck of the tooth.

It was my good fortune to have access to a number of specimens of Dr. Bödecker's collection, taken from a six-weeks kitten, in which the disease under consideration is developed in the earliest stages, which have been studied with great pleasure and interest. The kitten was born with an umbilical rupture, which increased in size from week to week. It was sickly and of low vitality, a repulsive specimen of the genus felis, and was killed after reaching the

end of its sixth week. It was placed in a solution of chromic acid, entire, and later on the lower jaw was enucleated, and placed in the same liquid until the bone and teeth were softened to a degree that enabled Dr. Bödecker to make the sections.

From what I have seen I would cordially recommend for an imbedding mass celloidin instead of paraffin and fat. Celloidin has the great advantage of filling the gaps and fissures of the specimens, thus holding the parts together which otherwise would be torn asunder while cutting.

For section-cutting Toma's machine was used, by means of which extremely uniform and thin specimens were obtained. Staining with ammoniacal carmine is in most instances sufficient for a differentiation of the tissues.

In one specimen the epithelial covering of the gums has taken a bright pink, the connective tissue a pale pink, the dentine remaining a bright green from the reduction of the chromic acid, and the bone of the socket a dark green for the same reason. Blood-vessels filled with blood retained their original color, not being affected by the carmine. I have to add that neither the horny layer of the epithelium nor the growth of leptothrix has been influenced by the carmine, as they retained a slight brownish-green color. All micro-organisms are known to resist the dye of carmine; whereas they eagerly take up all sorts of aniline dyes. Thus a single specimen shows a variety of colors, which serves as assistance for the discrimination of otherwise not well-marked tissues.

Mounting in glycerin is superior to the old-fashioned method of mounting in Canada balsam. Even mounting in glycerin-gelatine is inferior to mounting in pure glycerin, because specimens look a little hazy if prepared in the former way.

With low powers of the microscope, just sufficient for obtaining topographical views, a molar was selected, in which the features I am about to explain are beautifully marked. (See Fig. 1.) The specimen is taken for illustration because on one side of the neck of the tooth the recession of the gum and the growth of leptothrix is marked without apparent suppuration; while on the other side, the growth of leptothrix has led to marked structural changes in the cementum of the neck, in the epithelium of the gum, and in that portion of the pericementum in contact with the uppermost portion of the neck, which by anatomists has been called ligamentum dentium. This term is rather superfluous, as it means nothing but the uppermost portion of the pericementum in teeth of the lower jaw, and the lowermost portion of the teeth of the upper jaw. The recession of the epithelium and of the gums is quite marked on both sides of the neck of the tooth, and, as said above, I would con-

sider the recession as the primary feature, by means of which the pouch is established in which the leptothrix finds a favorable soil for its development, and deposit of the lime-salts. No sign of trouble below the pouch, or pocket, is seen on the right side of the

Fig. 1.

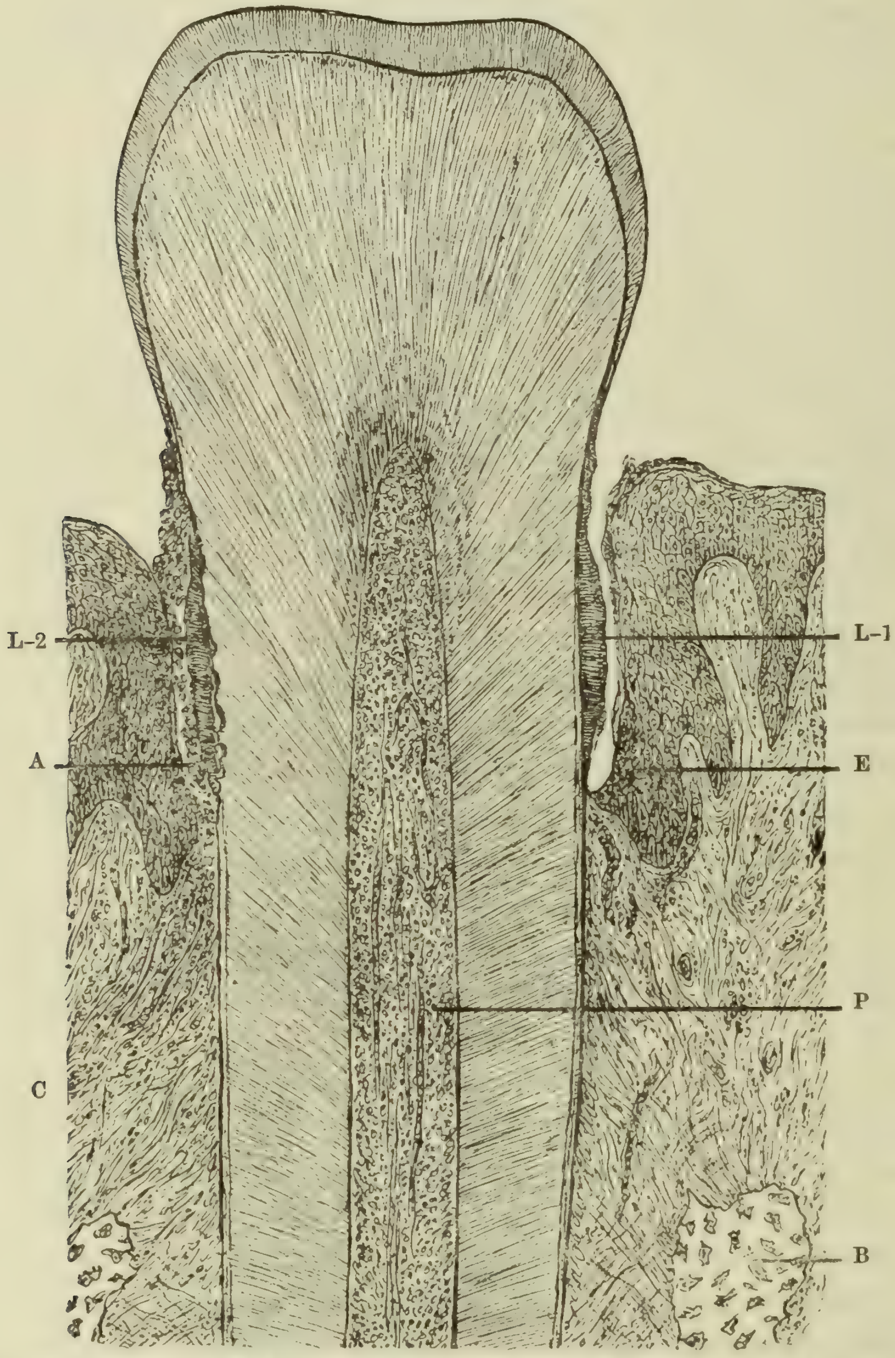


Fig. 1.—Temporary molar of a kitten six weeks old, showing the earliest stages of pyorrhea alveolaris. P, Pulp-tissue with capillary blood-vessels. B, Bony socket. C, Fibrous connective tissue, producing upward the stroma and the papillæ of the gum, downward the pericementum and the periosteum. E, Epithelium. L-1, Cluster of leptothrix deprived of its lime-salts. L-2, Cluster of leptothrix upon an eroded neck of tooth and entangled with pus-corpuscles. A, Cavity filled with pus in continuity with the pericementum. Magnified 50 diameters.

specimen, except a slight hyperemia, marked by slightly dilated blood-vessels, filled with blood-corpuscles.

The first mass indication of trouble in the human mouth is redness and swelling of the receded gum, accompanied by congestion of the

blood-vessels. The next stage is a pronounced inflammation of the gum, with partial waste, or more thoroughly expressed suppuration; this latter process in some individuals may be so slow or obscure as to evade detection of the pus, and only the final result—viz., the laying bare of the root of the tooth—demonstrates the waste of the gum as well as of the pericementum. In most instances, however, the formation of pus is a marked feature of the disease, and the process is illustrated on the left side of Fig. 1, where the pouch appears filled with pus occupying the space between the leptothrix and the receded gum.

Wherever we observe waste of the gum by suppuration, which in turn leads to destruction of the pericementum itself, the question arises, Whence comes the pus, and where are the pus-corpuscles formed? How is the tissue destroyed whenever suppuration sets in? In other words, the great question of modern pathology arises in our minds, What is the source of the pus-corpuscles?

Virchow, the great founder of the cellular pathology, asserted thirty-six years ago that the cells of the connective tissue being the only living elements, through a process of division and proliferation produced the pus-corpuscles. This view held sway until Cohnheim, twenty years ago, rather inadequately made the statement that all pus-corpuscles are emigrated colorless blood-corpuscles, or leucocytes, which by their accumulation lead to a liquefaction of the basis-substance, completely replacing the tissue. In this view the protoplasmic bodies of the connective tissue were absolutely inert, being killed by the leucocytes. Though much opposed by Stricker, this theory has a great many adherents, especially in Germany, to this day. Cohnheim in the last year of his life admitted, however, that in the inflammatory process, termed plastic or reparative, the connective-tissue corpuscles do proliferate, but he would not admit this process for suppuration. In the mean time we have learned that not only the so-called connective-tissue corpuscles are alive, and capable of proliferation, but the basis-substance itself is alive, responding to an irritation in exactly the same manner as protoplasm does in general. This view being supported by a physiologist of such standing as that of Stricker, is our standard for the explanation of the process of suppuration. It means that after the dissolution, or liquefaction, of the basis-substance, the living matter previously concealed in it is set free, and every particle of it is enabled to grow from the size of a granule to that of a lump, or nucleated corpuscle, the sum-total of which gives what pathologists are wont to call inflammatory infiltration.

So long as the newly-formed corpuscles remain in mutual connection, the inflammation may terminate in a new formation of tissue,

the so-called hyperplasia; whereas, if the inflammatory corpuscles break asunder, they represent pus-corpuscles, which are suspended in serum, rich in albuminous matter. (See Fig. 2.) Here we see in the connective tissue, furnishing the papillæ, as well as the pericementum, a gradual transition from basis-substance to pus-corpuscles. At first the connective tissue appears granular; later granular or solid lumps make their appearance, and at last the basis-substance has almost completely disappeared, being replaced by a number of so-called inflammatory corpuscles. As soon as the latter become

FIG. 2.

FIG. 2.—Formation of pus from connective tissue and epithelium in pyorrhea alveolaris of a kitten six weeks old. E, Epithelium of gum with proliferating nuclei. EP, Epithelium in transformation to pus-corpuscles. P, Pus-corpuscles sprung both from epithelium and connective tissue. C, Connective tissue of gum. B, B, Blood-vessels filled with corpuscles. N, Cementum of neck of tooth. D, Dentine. Magnified 600 diameters.

isolated they represent pus-corpuscles, which invariably are intertwined in smaller lumps and scattered granules, probably from a disintegration of some pus-corpuscles. Those who adhere to the emigration theory would deny that epithelium ever would give rise to inflammatory or pus-corpuscles; whereas, we who admit that the

deeper layers of a stratified epithelium are endowed with all the properties of growth, find no difficulty whatever in explaining the image represented in Fig. 2. Here we observe a gradual increase of the living matter of the epithelia from a mere division of splitting of the nuclei to a considerable increase of lumps within the epithelia, and to their breaking up into isolated lumps or corpuscles,—viz., pus-corpuscles. There are microscopists who assert that the process of division of the nuclei must be preceded by a formation of filaments in the nucleus, which they call karyokinesis or mitosis. But since Virchow has drawn attention to the division of nuclei in inflammation this fact has not been doubted, and we will scarcely admit that the figures of karyokinesis are required for corroborating an occurrence that has never been doubted by observing pathologists.

In epithelial layers the cement-substance between epithelial bodies holds a good deal of living matter in the shape of connecting filaments, previously termed the thorns (Max Schultze). Close observation shows that these thorns at first increase in bulk; afterwards coalesce into solid cord-like formations; farther on swell up to pear- or club-shaped formations, which themselves split up into pus-corpuscles, thus adding to those visible in an abscess. The pus-corpuscles sprung from previous epithelia are in no way different from those originated from previous connective tissue.

To-day it is a well-nigh established fact that suppuration will not take place either in connective tissue nor in epithelium without the presence of certain micro-organisms which are known as staphylococcus, or streptococcus pyogenes aureus, albus, or citreus. It is a great question yet to decide whether it is micro-organisms themselves penetrating the protoplasm, thus inducing disintegration of the tissue, or whether it is this chemical product of the micro-organisms, the ptomaines, that induced the suppuration. However this may be, the specimens here presented furnish conclusive proofs that, so long as the horny or pavement epithelium is present as a protective layer, no invasion of micrococci will occur. As soon, however, as this protective coat is lost the micro-organisms may penetrate both pavement epithelium and connective tissue, at once inducing mischief.

On the right side of Fig. 1 the pouch between the tooth and the gums is lined all around by flat epithelia; there is a marked hyperemia of the connective tissue, but no marked inflammation or suppuration. On the left side, on the contrary, the pavement epithelium is lost at the bottom and the sides of the pouch, and suppuration has started at once. Whether or not the growth of leptothrix alone is sufficient to excite inflammation or suppuration

is not settled, but we can easily conceive of a possibility that together with the leptothrix other micro-organisms are carried along, being ready for the invasion of the formed tissues as soon as the protective horny layer is lost.

Attention has been given to the morbid changes of the cementum at the neck, wherever they come in contact with the leptothrix. (See Fig. 3.)

Some observers claim that even a simple inflammatory process may be produced by the presence of micro-organisms. This assertion I

FIG. 3.

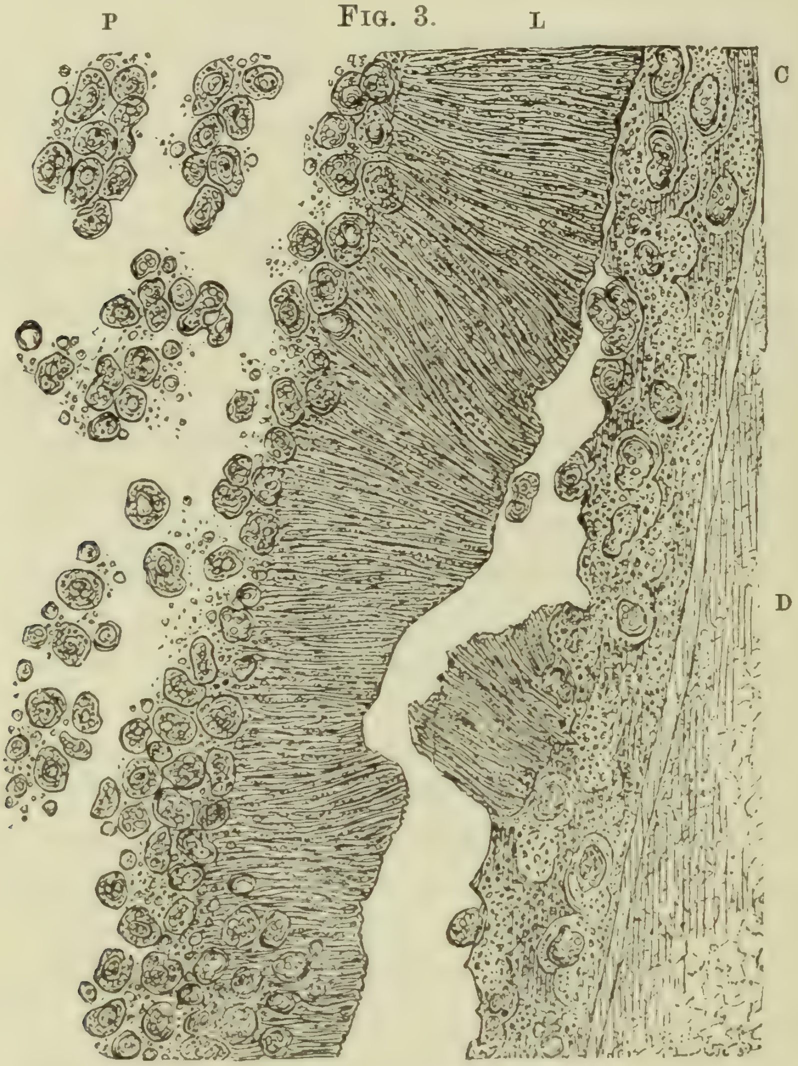


FIG. 3.—Cementitis indicated by a growth of leptothrix on the neck of the tooth of a kitten six weeks old. L, Leptothrix. C, Cementum of neck. D, Dentine of the neck destitute of canaliculi. P, Pus partly entangled with leptothrix. Magnified 600 diameters.

am not able to sustain from the study of these specimens, or any that I have seen. True, wherever leptothrix has encroached upon the hard tissues of the tooth, a melting down of the lime-salts of such tissue will be the result. In the milder forms of such a decalcification (so called) we observe bay-like excavations, partly containing isolated protoplasmic bodies, clearly the offspring of the perfected tissue, present even in the hard tissues of the tooth. But the number of such corpuscles is never sufficiently large to warrant the

diagnosis of inflammation; all we could claim is a reduction of the hard tissue into soft protoplasm, probably corresponding to a juvenile or embryonic stage of that very tissue. On the left side of Fig. 1 bay-like excavations are discernible, penetrating not only the cementum of the tooth, but also the dentine; still, there is nowhere a symptom of inflammation or caries. Here our microscopical finding again agrees with clinical experience, which teaches us that in pyorrhea alveolaris the exposed roots of the teeth very rarely become carious, usually exhibiting only a slightly roughened surface. In drawing conclusions from the specimens just described, it will be well to call attention to the fact that in the view of latest observations inflammation is nothing else than a return of the affected tissues into their medullary or embryonal condition. Suppuration, then, is in to-day's views nothing but a disintegration of the inflamed tissues into isolated corpuscles, supposed to be due to the presence of pyogenic micro-organisms and their ptomaines.

It is rather narrow-minded to attribute specific energies to epithelium on the one hand, and to connective tissue on the other. Those who claim such specific energies for delineations of the three layers of the embryo—*i.e.*, the epiblast, mesoblast, and hypoblast—lose sight of the fact that before such layers have appeared there has been present nothing but an indifferent medullary or embryonal tissue, the direct offspring of the segmentation of the germ. Why should we confine ourselves to the stages of the three embryonal sheets? Why not go a step farther backward to the stage of indifference? Why maintain that epithelium will never change into connective tissue, and that connective tissue can never change into epithelium? In the process of inflammation it surely makes no difference what kind of tissue is affected as long as the tissue is alive and capable of growth and proliferation; the final result is the same both in epithelium and in connective tissue,—viz., the recurrence of the embryonal stage, or the stage of indifference. The final result—viz., the suppuration—is nothing else but a breaking asunder of the inflammatory corpuscles, therefore a disintegration of the tissue itself.

Pus, as long since established, is the product of loss of tissue, but not tissue itself, and never capable of producing tissue.

It is now time to ask what lesson these specimens teach. And to reply: First, They show that some departure from normal activity has so far effected its work as to mar the characteristic features of the tissues before it can be seen; second, that, instead of finding out the agent of destruction, we have only traced it to a less massive hiding-place of obscurity in the molecular changes preceding all perceivable modification in tissues. Which leads to the

query, What have we gained over the "euplastic" and "cacoplastic" conditions of the Greek pathology? To which we reply: The deeper we go into the studies of dynamical mechanics and mechanical dynamics the more profoundly are we convinced that we know but in part the highways and the by-ways of functional activities; consequently we are unable to formulate them in demonstrable syllabus so as to meet the demands of our necessity.

Perfect digestion produces perfect peptones, which enter into the tissue-elements without débris other than that produced by exercise of function in feeding ultimate corpuscles as elements or bricks of which the tissue is built.

In this sort of change of form and place of molecular bodies constituting proximate principles—pabulum—there are no unemployed molecules left with unsatisfied bonds of affinity, and therefore no excess by which aberrant currents are invited so as to produce residuary ashes as points of ingress of inharmony in this first form of tissue-feeding.

The first form of disturbance, then, goes back of the peptone into the machinery forming it,—viz., the digestory apparatus, in which the work of producing the peptone (perfect-pabulum) is effected. This proves that dyspepsia (cacoplasty) arises from imperfectly prepared pabulum: which is manifested in the weakened connective-tissue corpuscles being so debilitated as to break the dental ligament away from the cement-corpuscles at the neck of the tooth, thus initiating the pocket into which foreign matters are precipitated. Is it not now plain that, if we desire to settle the vexed question of this occult disease, we shall have to turn our attention to a close study of physiological chemistry? In this effort we find that we must be able to discriminate veritable "chemical individuals" as the first postulates of our attempts to even form the propositions which we propose to examine. That our first postulate, "protoplasm," is a tissue is one of the "must be's," while opposition to this teaching is only one of the "may-be's," of the effort at unraveling the poliversity of the phases of the falsely-named *universe*!

Let us, then, rather seek to be familiar and *en rapport* with the be's as they are until the may-be's are transposed into the must-be's in the arena of psychic perception of function and factor of function!

Discussion.

The President. In the absence of Dr. Harlan, who was expected to open this discussion, we will call on Dr. Peirce, whose name is next on the programme.

Dr. C. N. Peirce. It is a question in my mind whether a specimen of a deciduous tooth, with the root more than half absorbed, taken from the mouth of a six-weeks sick kitten, represents the disease with which we are familiar as pyorrhea alveolaris,—a disease which afflicts mankind, and from which probably more teeth are lost than from any other affection that comes under our hands among the abnormal conditions which we are called upon to treat.

The doctor has told us that in this specimen he found pus,—pus in the socket. That would indicate pyorrhea, which simply means pus in the socket. He also told us he found leptothrix in this pus. Anyone of you can find leptothrix if you take a small instrument and draw from the mouth of your patient a little of the débris that is lodged on the teeth. But that does not prove there is pyorrhea alveolaris,—because we find leptothrix. He has examined the tooth of a sick kitten, that never had a well day, and never was well nourished, and he tells us he found the gum-tissue poorly nourished. How could it be otherwise? And how could the representations obtained from that disorganizing, diseased tissue be any guide to us in our study of pyorrhea? But for the title of the paper, my friends, I am afraid we should not have recognized it.

What I have to say this evening will be simply of the clinical aspect of this question. I have made no microscopical examinations of the tissues, but I have had under my charge at various times, and have at present, a number of cases that have been of intense interest to me, and probably of more interest to the patient.

The first inquiry that I put to myself is, Cannot we find a better term to express the condition which we are attempting to discuss than pyorrhea alveolaris? In conversation with my friend, Prof. Black, this evening, he suggested a name that I think far more appropriate, that of phagedenic pericementitis,—a pericementitis that was not induced by the presence of lime. We have there two phases of the disease; and everyone who has given any thought to it, or care in its treatment, has found that he could readily distinguish between those two phases of this disease; that is where you have a specially prominent phagedenic condition, and without the presence of tartar. In the other phase there is tartar present, following down towards the apical end of the root. We have still another condition that we term pyorrhea, found in mouths of young persons, and which is very rare. I am very loth indeed to class it as the same as that we find in the adult. Rarely do we find it under forty years of age, and more frequently later. We find individual teeth affected with what has been termed pyorrhea. In one case I found it in a boy of fourteen, and several others from twenty to twenty-five years of age. Those cases are rare. I believe these cases

are curable, and they should not be classed with the others, about which there is much doubt as to the possibility of curing or relieving the patient permanently—preventing the return of the disease; hence the treatment of these cases in later life is usually palliative rather than with the hope of entirely curing the disease. In these cases in the mouths of young persons I find the gum inflamed, and loosened from the neck of the tooth; and on pressing upon the gum a drop of pus is readily brought to the surface. We find also usually a slight accumulation of tartar, not only on the neck of the tooth, but also pervading the tissue over the root towards the apical end. But those cases have been cured so that the disease has not made its appearance a second time, after a few judicious treatments. In the cases where we have a phagedenic condition, with destruction of the gum and the process until the root of the tooth is quite exposed to the apical end, the possibility of cure is extremely doubtful, and our treatment is largely palliative. They may be classed oftentimes as acute cases. They commence, progress rapidly to a certain condition, and at that stage they may be held for years by proper treatment, and the teeth saved to the advantage of the patient. In the other class, where there is an accumulation of tartar, we have a longer history, and a condition of instability that precedes the accumulation of tartar.

I simply give my own experience. I have been observing this disease for some years, and have a record of many cases, and I have never yet seen a single case of pyorrhea which resulted from or was accompanied by a large accumulation of tartar, that was not preceded by what you might call an induration of the tooth-tissue. I say induration of the tooth-tissue; and I mean by that the filling up of the pulp-chamber. I have yet to see the first case, in adult life or middle age, where pyorrhea was not preceded by an almost total obliteration of the pulp-chamber; showing a tendency to excess of lime-salts in the system, and resulting, it may be, in the extermination of the pulp. Following that there is usually a sanguinary deposit, or a salivary deposit. Dr. Atkinson told us that the salivary deposit commenced always at the neck of the tooth. I can show a number of cases where the first deposit was at the end or near the end of the root. It was a sanguinary deposit from the blood of an amorphous salt upon the cement, with some lime deposit near the end of the root. I recognize it by the purple condition of the gum opposite the apex of the root. That was the commencement of the case, and the commencement of similar cases in my practice. The disease progressed from that point towards the neck. The accumulation of tartar was more or less over the whole root, but the inflammatory condition of the gum was chiefly opposite to

the apex of the root, and there was where absorption of the process had taken place first. I cannot explain why, and I cannot explain how; I only give you the clinical aspect that I have noticed in my practice. Absorption had taken place, and the end of the root had been deprived of its protection; there was a roughened surface there, and the disease progressed from that point to the neck of the tooth.

A voice. Was it a living tooth?

Dr. Peirce. It was a living tooth. We have another condition that we must recognize. I never yet saw dental caries progressing in a tooth that was affected with pyorrhea. I never yet saw dental caries progressing in a mouth where several teeth were affected by this disease. What is the significance of that? It is this: we have a secretion present,—I do not say that such teeth had never decayed, but from the time when the disease commenced its progress, and tartar became present on the root, decay ceased entirely. There may have been plenty of cavities in the mouth, but decay was not progressing. The significance of that is that the secretions were so changed that there was an excess of lime-salts present which overcame all tendency to disintegration of the tooth-structure, because there was no solvent. We cannot have decay in teeth without the presence of a solvent that will carry out the lime-salts. If the secretions are so loaded with lime-salts, it is not possible for them to break up the tooth-structure. That is a significant fact that we should remember. It is an indication that there has been a change in the system, a change in the secretions. I believe further that those cases of pyorrhea where an excessive deposit of tartar accompanies the disease may be called hereditary. I have never seen a patient so affected from whom I could not learn that one or both of the parents, or an aunt, or some two or three members of the family, were affected in the same way. I am speaking now of that phase of the disease which is accompanied by an excess of salivary calculus, not of the phagedenic condition. This shows that there was an inherited predisposition to the disease, as I believe, and I think it is so in a large majority of cases. It may skip a generation, but you can generally trace it as an inherited affection.

I have never seen a case of urinary calculus, or of biliary calculus, where there were not other members of the family affected in the same way. Physicians have said to me that they had patients suffering with calculus, and I have asked to see them, and I have universally found a bicuspid, or more frequently a first molar, or one or two of the inferior incisors, affected in that way; showing that there was an excess of lime-salts in the system, which manifested itself by deposits of this amorphous salt, not only through the saliva

but directly from the blood as a sanguinary deposit, which facilitated if it did not cause the disease.

The question of treatment is one that I hardly think should come into this discussion. We all have our favorite methods of treatment, and all feel that we do some good by arresting the progress of the disease. I occasionally have a case come in that surprises me by its satisfactory results, the progress of the disease having been entirely arrested and every appearance of it vanished. Only last Friday a lady came in who had been in my care for two years, and I was surprised to find all the teeth in a healthy condition and no vestige of the disease in the mouth; and yet she had been for two years with the anterior incisors and one lateral quite loose and pus oozing from their sockets. The treatment I used was simply aromatic sulphuric acid. I use it freely in all such cases, varying it sometimes with chloride of zinc, and sometimes with other remedies. Sometimes patients ask me what will free their mouths from the accumulation upon the mucous membrane, and I tell them if they are fond of acid drinks to indulge in them to the extent of their health; and I have found that wherever patients have indulged in lemonade or other acid drinks their mouths have been kept in better condition. That treatment has always brought satisfactory results. I have instructed a patient to omit the use of acid drinks for a month, for the purpose of seeing what the effect would be, and then resume them, and I have found that the mouth was in much better condition, the gums firmer, the accumulation of tartar less, and there was less pus while the patient indulged in the acid drinks and the use of lemons before going to bed at night, than there was after a month's abstention from these acids.

Dr. E. T. Darby. Mr. President, Ladies and Gentlemen: A person always labors at a disadvantage in trying to discuss a paper before he has heard it. I do not mean to say that I did not hear Dr. Atkinson's paper, but it is very much like asking one's opinion of a dinner before he has digested it. Dr. Peirce has taken all the wind out of my sails, for he has said everything that I intended to say, and said it a great deal better than I should have done; so you see there is an advantage in coming early in a discussion. Whatever I may have to say now will be very tame, after the able manner in which Dr. Peirce has spoken.

I am very glad that attention has been called to the etiology of pyorrhea alveolaris. I would be glad if we had a better term. I am also glad that the doctor has called attention to the distinction between the two varieties, the phagedenic and the calcic. Of late we have come, I think all of us, to consider that there are two distinct types of this disease. There was a time when we considered

it, or I considered it, under one head, as calcic, attributing it largely to that cause; but in my opinion the most fatal cases that we meet with are seruminal, or sanguinary, from the blood or the serum.

I had a talk with Prof. Black yesterday, and he asked me if I did not think the calcic condition preceded the other, or whether I had ever seen the seruminal or phagedenic condition before I had seen the calcic deposit. I cannot say positively that I have done so; but I have seen instances where the sanguinary deposit or a deposit from the serum was decidedly more marked, in cases where there was very little calcic deposit around the necks of the teeth. He also made another inquiry of me: whether there was not always some gingivitis, or inflammation of the gingiva, preceding the calcic deposit. I think there is, so far as my observation goes, always some irritation and change of the margin of the gum before there is any deposit.

A few years ago, when listening to some of the men who had made greater reputations, perhaps, in the treatment of pyorrhea alveolaris, I was very skeptical as to the cures they professed to make; and I don't know but I have been guilty of saying I believed no man had ever reproduced any quantity of new tissue which had been destroyed by this disease. I have modified those opinions a little, and am willing to admit that new tissue has been formed, and that cures have been temporarily effected; but that permanent cures are ever effected in this condition I very much question. I do not remember ever having discharged a patient of this kind who I was able to say was permanently cured. I do not doubt that we produce some good result in every instance. But if we expect to keep our patients comfortable after we have once arrested the disease, we must see them at frequent intervals. Sometimes we cannot see them too frequently unless we see them every day. I have in my practice some cases that are exceedingly interesting. One of them is of especial interest, as being in the mouth of a person so young. Formerly it was supposed that this disease was found more frequently after twenty-five or thirty years of age. I have in my practice one of the most pronounced cases that I ever saw, which began as early as fourteen years of age, in the mouth of a girl. At the present time I should say the case was incurable. Many of the teeth have been lost in spite of every effort I could make to preserve them. She is now a young lady of twenty-two years, and I consider the case a hopeless one. I would be very glad if it were in the hands of some of those gentlemen who profess to perform greater cures than I am able to do. I inquired very carefully as to any hereditary tendency or trait of this form in the family, and I found that in her own immediate family, brothers and sisters, they

were entirely free from it. They had been patients of mine for years, and there is not the slightest trace of anything of the kind in their mouths; the mother is entirely free from it, and the father went to his grave with an excellent set of teeth. But I found that two aunts, sisters of the mother of this girl, lost their teeth by this very disorder. So I am led to believe, as Dr. Peirce does, that there is a hereditary tendency, which may affect a portion of a generation only, perhaps, but which may be traced back through the family for generations or centuries.

As regards the treatment of this disease, I don't know that I have anything to say. There was one point of especial interest to me. In conversation with Prof. Black last night, I learned from him one fact that leads me to suppose we do not know as much about this disease as we shall know a little later on. He said to me that he had discovered that lower animals lose their teeth in a similar way to the loss of human teeth which is incident to pyorrhea alveolaris. He said, for instance, that there was in sheep a certain disease of the mouth by which their teeth are lost. I inquired if he knew the character of the food upon which these sheep subsisted before their teeth were lost, but he was unable to tell. I also inquired whether in connection with this loss of teeth there was not some nasal catarrh. There is a disease in sheep called nasal catarrh, by which the sheep are very much reduced in flesh and become worthless as sheep. The question arose in my mind whether there was not some connection between the two conditions, between the loss of the teeth and the catarrh. I have frequently observed, in persons who were suffering from pyorrhea alveolaris, that there was catarrh of the mucous surfaces of the mouth; and in cases of pronounced pyorrhea alveolaris I have never had any doubt about its existence.

Dr. James Truman. Mr. Chairman and Gentlemen: I am very much like Dr. Darby in this matter, and a good many others who have taken part in these various discussions, in that I have not had the good fortune to read the paper. But fortunately for me, I think, and perhaps for you, I have so far this time understood the essayist of the evening better than at any former period of a very considerable experience in his preaching or talking. As far back as I can remember, I think,—and it is a good while since I have known something of Dr. Atkinson,—he has always claimed to receive his inspiration from angelic sources; and now that he has come down to ordinary mundane experiences I believe I understand him better, because I have always had difficulty with the dead languages, and when it comes to the very dead languages I am a very poor hand to understand.

Now from an angel to a cat, and that cat a sick kitten, is a very

long journey. But I am extremely glad that he has taken it. I was pleased with the paper; pleased because it ran in a different direction from what most papers do. To me it led up to a good many thoughts. I am interested in this subject, and have been for these many years; and when Dr. Atkinson endeavored to show, or at least to argue to a limited extent, the origin of pus, I felt an especial interest, because it is a subject of vital importance to all dentists, if they will only look at it in a proper light. From the time that Döllinger, in 1819, explained something of the character of the white blood-corpuscles, all the way down through Williams and Addison, and finally Waller, who so thoroughly exemplified the character of the white blood-corpuscles, or as it is termed now the leucocyte of the blood; and when subsequently Cohnheim electrified the world with his wonderful experiments in this direction, simply carrying out the idea that was so fully explained by Waller,—all this was entirely forgotten by the medical men of the world at large. This work of Cohnheim and Waller, the so-called Waller-Cohnheim discovery of the migration of the white blood-corpuscle, has been the subject of controversy from the time Cohnheim gave it forth until the present day; and we have at this time two classes of thought, one originating with Cohnheim and his followers, and the other with Stricker and others, as to the retrograde metamorphosis of the tissues back to their embryonal condition. Now I do not propose to follow this up; but it is interesting, and I was glad that Dr. Atkinson mentioned it, because the more we know of the protoplasmic elements and their character, and their change into new life and dead life, as it were, the better we will be prepared to understand pyorrhea alveolaris.

I said a few moments ago that this subject had claimed my attention very seriously at least twenty years ago. It was at that time one of the subjects that I knew very little about. My interest became centered in it because this disease occurred in a member of my own family and required my immediate attention. I consulted the old French writers, and took Magitot for my guide in the matter. I tried his remedies with no success. I then entered into a microscopical examination of the subject with the best means at my command at that time, and I satisfied myself thoroughly then and there that the cause of the disease was not calcific deposits, as was supposed, but micro-organisms, as we understand them at the present time. I have not time to detail the various experiments and examinations that extended over a long period of time and that led me to these conclusions. Suffice it to say that in all conditions of pyorrhea alveolaris I found an increase of micro-organic life, and not only an increase of life but an increase in size and activity.

Let me here just say a word in answer to what has been said in regard to change of name. I am opposed to it. I believe that pyorrhea alveolaris is a misnomer; but words change their significance. You all know that in the English language probably very few words have retained the original idea found in their root forms; and in the same manner the meaning of pyorrhea alveolaris has changed to every one of us. We understand it now entirely different from the early French writers. So I hope it will be retained. Do not let us mix up this thing with that new word phagedenic that has been named. In a very little while some one would call it phag, just as it is now called pyorrhea. There is that tendency to abbreviation. We do not want any more names. It troubles us in teaching, and it is a bother all the way through in the investigation of this subject.

Now, in regard to calcific deposits. We hear a great deal at the present time of seruminal deposits, and sanguinary deposits; but I have yet to see the individual who has undertaken to explain the difference between the calcific deposit that is found on the roots of these teeth,—either by chemical analysis or any other way,—and the ordinary calculus that we see in the mouth. I have yet to see any one who can positively demonstrate that the calculus found on the roots of these teeth is deposited from the serum, for not only serum, but pus itself, will deposit calcareous matter, and we are not able to distinguish between them. Therefore it is stating too much to say that this deposit is seruminal, or sanguinary, or salivary calculus, or what it is. As far as my observations go, salivary calculus, or any other calculus, has very little or nothing to do directly with pyorrhea alveolaris. I do not say that it may not produce it; I believe, and know, that it can; but the real cause is first an inflammatory condition set up along the margin of the gum, and gingivitis is produced. Then comes in the development of micro-organisms, which necessarily follow all inflammatory conditions in the mouth, and we have the waste products adding to the trouble, and finally perhaps we may have calcific deposits. If this be true—and I regard it as true,—it is simply a slow process of pericemental inflammation, and nothing more than that; and when you treat it upon the same general principles as in treating ordinary pericemental inflammation, then I think you will have some degree of success. I am opposed personally to this kind of treatment that commences with scraping the root, and mostly ends there. I believe in removing all calcific deposits, but I have had a large number of cases of pyorrhea alveolaris where I could find no deposit whatever.

I do not believe with Dr. Peirce that this calcification of the pulp in all these cases, or in many of them, or in any of them probably,

has anything to do with the cause of this disease. I do not believe that it has its origin in any kidney trouble, although it may have something to do with it. I do believe it is simply an accretion of foreign matter around the neck of the teeth that may occur in any mouth and at almost any time.

The case that I spoke of in my own family I treated on general principles, and that tooth is good to-day. Now, what are those principles? I have not time to go into the treatment; but I will say the first thing to be done is to remove the primal cause, and if that cause is from accretions of calculus they must be removed; then immediately follow that with the destruction of the micro-organisms, which, while they do not produce this disease, are a secondary agent in the destructive process. Then by similar and continued antiseptic treatment you can carry the thing to a perfect conclusion.

Dr. Adair. It would be presumption on my part to undertake to criticise the paper of Dr. Atkinson, especially since he has been inspired by the angels to write it. My observation and study of the disease called pyorrhea alveolaris have been in a clinical or practical way, and I have not had the advantage of studying the disease as the essayist has; therefore I shall not attempt to discuss it except in a practical way. I have listened to the paper attentively, and the only objection that I can have to it is its lack of practical ideas, the practical benefits that we could appropriate as practitioners. My observation and study of the disease have been of a purely clinical character. I have been practicing in a newly-developed section of Northeastern Georgia, where my patients have not been educated in dental hygiene as they have been in New York; and the conclusion I have come to is that it is a purely local affection, produced by a deposit of calculus. A large majority of the cases that have been presented to me for treatment have been remarkably healthy persons, and some of them told me they had never taken a dose of medicine. I have attributed this disease in nearly every case to a lack of cleanliness. I am satisfied that pyorrhea alveolaris produces constitutional trouble; but I do not think constitutional trouble produces pyorrhea alveolaris. I think it is purely a local affection, not a local manifestation of constitutional trouble, and I have treated my cases with that idea. Now, what I shall have to say will be more particularly in the line of treatment. Several years ago, having had so many cases presented to me, it engaged my attention, and I began to study a method of treatment. Frequently I found a great sac or pocket running down along the side of the tooth, which was loose; and sometimes it went to the apical foramen of the tooth. After a while I came to

the conclusion that it was necessary to remove the deposit of calculus clear down to the apical foramen, then scrape the bone and remove all the necrosed bone, and everything of an irritating character. Then the idea came to me that unless that pocket was protected from food being forced into it and retained there we would soon have the same state of affairs again; we would have micro-organisms deposited from the food being forced down into the pocket, and it would be impossible to keep it clean. After considerable experimenting I came to the conclusion that a preparation of tannin and glycerin applied to the pocket so as to fill it and seal it up would be beneficial; and my practice now in treating those deep-seated pockets is, after the surgical operation has been thoroughly performed, to apply tincture of iodine dissolved in pure wood creasote, applying it daily as long as there is any manifestation of suppuration; then fill the pocket with a preparation of tannin and glycerin, thereby hermetically sealing it. This tannate of glycerin seems to form a tannate of albumen. After twenty-four hours I repeat the operation.

It has been stated here to-night that cases have been seen where there were calcareous deposits down on the roots of the teeth without any external opening to those deposits. I have my doubts about the correctness of that statement. I have never seen a deposit of salivary calculus upon the root of a tooth without finding somewhere an external opening down to it. It may be small, but I think a careful examination will always discover such an opening.

Dr. Peirce stated that he always found calcification of the pulp-canals in connection with pyorrhea alveolaris. I shall take issue with that assertion. I have never found that state of affairs in any cases I have treated. He also stated that caries ceased to operate upon teeth when the patient had pyorrhea alveolaris. My observation does not confirm that idea. Several patients that I have recently treated for this affection, whose teeth I had previously filled and put in perfect order, had new decay take place while affected with pyorrhea.

Dr. M. L. Rhein. Mr. President, Ladies and Gentlemen: I have not been placed under the disadvantage that the other gentlemen have alluded to in not having seen the paper of the evening. I had the pleasure of having it read over to me, and consequently I have been able to prepare what remarks I have to make on this subject. But first I would like to say a word or two in reference to the very interesting discussion of the evening. Every speaker who has discussed this subject here to-night has made remarks that did not accord with the clinical facts, and that disagreed entirely with my

own experience in this disease; and it only shows us how much remains to be studied and learned concerning it. But, although so many eminent gentlemen have not observed accurately the same facts and phenomena, certainly the disease exists, and some means ought to be obtained of enabling us at least to understand its proper diagnosis.

Dr. Truman stated that he could not see any differentiation between calcic, salivary, and seruminal deposits. I will present this evening an extracted tooth that has around the apex of the root clearly-defined nodules of seruminal deposits, and has not and did not have a trace of salivary deposit when it was removed.

In regard to Dr. Peirce's remarks, I have noticed the fact that he brought out very clearly the calcification of the pulp-chambers; but I have noticed it only in advanced stages of pyorrhea, and in those stages I have always observed that the pulp-chamber is almost entirely obliterated. Whether that is due to the disease or whether that condition would be found anyway I will not stop to discuss; but it is a clinical fact that has been very clearly demonstrated to me. In regard to the absence of decay during the progress of this disease, I must disagree with Dr. Peirce, because I have seen numerous cases of decay going on during the progress of pyorrhea.

With respect to the remarks of Dr. Adair, the only conclusion I can draw is that he has seen but one form of pyorrhea. It is true that it is pyorrhea alveolaris, but it is a very simple form,—that due entirely to uncleanliness; and the very fact that the people where he is living and practicing have but slight knowledge of the hygienic relations of the mouth has very likely borne out that idea in your minds.

[Dr. Rhein then read the paper on this subject which was printed, with illustrations of the cases presented, in the March number of the DENTAL COSMOS, and which may be found at page 184 of that issue.—EDITOR.]

Dr. A. R. Starr. Mr. President and Members of the Society: I shall have a very few words to say in the way of criticism of Dr. Atkinson's excellent paper. It has been very ably criticised by those who have preceded me. All I regret is that Dr. Atkinson did not spend a little more time in giving us his views in regard to the nomenclature, etiology, pathology, and treatment of this disease in which we are so much interested. I wish that Dr. Atkinson would evoke the aid of his inspired intelligence and the assistance of his particular angels and invent some term which would be more appropriate for this disease than that of pyorrhea alveolaris, or any of the other terms which have been proposed.

In regard to the different varieties of this disease, I think I have observed at least three: one which we might call the acute variety, or primary variety, which is induced by the presence of foreign bodies which work down under the gum to the alveolus and cause the acute symptoms of this disease; another variety which we might call the chronic variety, and which is the ordinary variety in which we find calcific deposits upon the roots of the teeth, and is the kind that is described by Prof. Black, in "The American System of Dentistry," as calcic pericementitis; and a further variety is one described by Prof. Black also, and called phagedenic pericementitis. It is the one which is the most difficult of treatment and which causes us, and the patient also, the most trouble.

Further than this I think I will not take up your time, as I am to be followed by one who has devoted more time and attention to this subject than I have, and who will be better able to present some practical views to you.

Dr. G. V. Black. Mr. President, Ladies and Gentlemen: I do not wish to take up your time at this late hour, but I must express my gratitude at seeing in the discussion this evening the marked advance that has been made in the consideration of this subject in the last few years. It has not been many years since the serious study of this subject began,—a serious study that was aroused by the efforts of the late Dr. Riggs, of Hartford. We were made to see that this was a field which we were neglecting.

This, as has been stated, is a local disease, or a local manifestation of disease. Here [drawing on the blackboard] we have the outline of a tooth, with the outline or borders of the calculus,—a variety which has been termed seruminal; but the position is not quite normal: the gum-tissue should come over farther,—close over a portion of the enamel. Here we have the gingival space. In a normal condition the epithelium never is attached to the cementum, but there is a point there over which there is no epithelial covering; and through this there is a more or less continuous leakage of corpuscles. If a person has taken mercury this leakage of corpuscles is increased markedly. If the effect is a little more severe we have decided pericementitis, constitutionally presented; yes, a pericementitis induced by a poison circulating in the blood, that has a peculiar affinity for these tissues, as we get the effects of remedies in various ways in various conditions of the system. Now, how many such poisons there may be that enter the blood, having a particular affinity for these tissues, we do not know. There are undoubtedly many effects produced upon this membrane from constitutional causes. There is some poison circulating in the blood that affects this particular tissue. Then we have the other conditions

of the disease that have been spoken of. Certainly an inflammation of the gums would not cause a deposit of calculus upon the crowns of the teeth, or upon the grinding surfaces and cusps of the teeth. That is a condition that arises independent of any disease of the gums. Here we have a seruminal calculus, or a calculus different from salivary calculus, that is deposited on the necks of the teeth, under the gingival border, in this gingival space, or even on the end of the root of the tooth in cases of alveolar abscess. It is different from salivary calculus. Then we have another form of the disease in which there is suppuration, or a condition of inflammation with a suppuration of the tissues from the cementum accompanied with pus-formation.

These are the outlines, briefly stated, of the conditions that we have found to exist; and I think, although the terms I have used in classifying these conditions may not have suited the profession, certainly these differences in the diseased manifestations found beginning at the gingival border should be sharply and clearly recognized, and when they are so sharply and clearly recognized as constituting distinct affections, I care not by what terms you name them.

Now, as to the subjects properly belonging to general pathology that have been discussed here this evening, they are very interesting, but it is too late to enter into them, and it does not belong to the subject properly under consideration.

Dr. Atkinson. I am very glad to hear the frank expression that has been made, even with such an exhibition of superficial understanding of a subject that was made so plain that a boy ought to understand it. Anyone who knows anything of histology at all should not make such a wretched mistake as to call seruminal, or serumal, a deposit that held a few leptothrix bacilli; whatever lime there was there having been dissolved by the acid used in preparing the section, and they being incapable of being dissolved by that solvent.

I know something about these things practically. I have amputated the entire end of a necrosed root, and it healed kindly and was left as healthy as can be; and I believe there is a living pulp in the remaining roots of the tooth. The periphery was recalcified so as to form a new alveolar plate. I can show you others where the points of the root have been amputated, the subsequent treatment being sponge-grafting; and in some instances the gum has grown entirely over, and in others only to the edge of the amputated end. The teeth are healthy, and as useful as the other teeth are. . . .

Do you suppose I do not know anything about that kind of trouble that is related to the little sieve that we call the leach of the

kidney, and its relation to the uriniferous tubes and their beautiful epithelial linings? If you knew the origin of the tissues and their source in the embryon and how they are built, you would see that these are but stages of transition from the indifferent state to the differentiated state. When they go up the ladder they go a step at a time, and when they go down the ladder they go a step at a time; or else they go down with a crash to the bottom, and then you have sphacelus; that is, by the stroke of death the entire tissue is thrown quite out in the sphacelate condition by a slough.

B. C. Nash, D.D.S., *Secretary.*

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

The regular meeting of the Odontological Society of Pennsylvania was held at the northwest corner of Thirteenth and Arch streets, Philadelphia, on Saturday evening, March 3, 1888, Dr. James Truman in the chair.

Clinic Report.

Dr. D. N. McQuillen, chairman of the Clinic Committee, submitted the following report of the March clinic:

The regular monthly clinic of the Odontological Society of Pennsylvania was held this afternoon, at the depot of The S. S. White Dental Manufacturing Company, Chestnut street, corner of Twelfth.

Dr. David Genese, of Baltimore, filled two cavities upon the grinding surface of a superior left second molar (which were very slightly undercut), with Williams's crystalloid gold, No. 90, using his cheek-distender and speculum in place of the rubber-dam or napkin. He also capped the pulp of a superior left lateral incisor with a preparation of nervine vita and Caulk's oxide of zinc, mixed to the consistence of putty. Dr. Genese also demonstrated the use of the syphon tongue-holder. . . . Dr. B. A. R. Ottolengui inserted a Logan crown in which he had placed a small gold filling in the mesial surface, upon the root of a superior left lateral incisor, using his reamers and trimmers in preparing the root and canal. He also demonstrated his method of treating sensitive dentine by the ether-spray and hot air. He claimed that it is absolutely necessary that the rubber-dam should first be placed upon the tooth. Dr. Ottolengui claims perfect success in all cases after a year's trial. . . . The tooth treated, filled, and bleached by Dr. H. C. Register at the January clinic was shown, and pronounced a complete success. . . . The piece of bridge-work made and inserted by Dr. H. D. Carr, of New York, at the February meeting, was exhibited. It is giving perfect satisfaction to the patient.

Theodore F. Chupein, D.D.S., of Philadelphia, read a paper entitled:

Some Data in Prosthetic Dentistry.

It has long been my conviction that a metal plate for the support of artificial teeth must be the most pleasant to the wearer and the least apt to produce that congested condition of the gum which we frequently see in persons who wear rubber or vulcanite plates. It is true that we have all observed this condition to exist under gold or silver as well as rubber plates, yet in the large proportion of cases the condition seems to be found under rubber plates, and most frequently with patients who are careless or untidy.

It is proposed in this paper to lay before you certain data on several points in "mechanical dentistry" (or, as it is now more elegantly styled, "prosthetic dentistry"), which have been gained from observation and actual experience and test, in order that you may be benefited thereby if you have failed to observe the same things yourselves.

That others have appreciated the idea of having a metal plate, or a plate in which there is a probability of conductivity, is seen in the efforts lately made in the way of lining rubber plates with gold. My idea is that such a procedure amounts only to a waste of time and an increase of expense, without in the least offering any beneficial offset or advantage. It does not secure the object—conductivity of thermal change—to the wearer, nor is it in any way beneficial; for, as the metal or gold lining is capped or covered by a non-conducting material,—the vulcanite,—there exists the same impossibility of thermal change in such plates as if no metal lining were employed. To refute the utility of this gold lining to vulcanite plates, it is only necessary to bring to your notice a fact which you all know and must all acknowledge. If we hold a needle in the blaze of a spirit-lamp, it would not be held there long before we would have to drop it, because of the heat being conducted through the length of the metal; but if we take the needle and push the point into the end of a match-stick, we may hold it in the blaze *ad infinitum*, because of the non-conductivity to thermal change existing in the wood. It follows, then, that the lining of rubber plates with gold, or any other metal, is of no use, so far as keeping the gums cool is concerned.

Your attention is called to another point in the construction of artificial work. The plan of procedure in the trying in of a set of teeth, prior to completion, as far as I have been able to learn, with the large majority of dentists seems to me to be open to objection, and cannot be pursued with that certainty of ultimate success

which ought to be our aim in any and all operations. This plan consists of molding on the plaster model of the mouth a wax base-plate, and on this mounting the teeth of replacement for inspection as to expression, length, contour, articulation, etc. If the patient bites on teeth thus temporarily mounted, the work will be ruined, for, as they are merely fastened on the trial plate with wax, the slightest pressure of the jaws not only forces the teeth out of position, but bends or distorts the plate also. To replace the teeth in their former position is no little work, for the saliva is carried under the teeth and all around the pins, so that no amount of pressing of the wax and teeth will get them back into place. Therefore, to mount a set of teeth in this way for trial is vexatious, and cannot result in any certainty of ultimate success. Again, should a set of teeth thus mounted be conveyed to the model for completion, there is no certainty that the plate will adhere or fit after the work is done, for with a wax trial-plate the patient is unable to produce suction, and there are always certain misgivings that, when the work is completed, it may have to be all done over, because of non-adhesion, or misfit, or rocking, or unequal bearing, which cannot be ascertained until the work is entirely finished. Besides this, there are certain "physical attributes" of vulcanite which, despite the most careful manipulation, defeat and thwart our best efforts. This is especially observed where the jaws are thrown considerably apart, thereby compelling the use of a large or undue quantity of rubber to unite the teeth to the plate. In such cases there seems to be an unequal expansion or contraction in the different thicknesses of the material at different points, which causes the plate to be drawn from or press unequally on the model, making it different in shape from the cast on which it was molded. In view of these facts, it is deemed best always to keep the jaws as close together as possible in taking the articulation, so as to secure an even thickness of the material at all points, and in the selection of teeth I greatly prefer the use of *plain teeth* to the gum-section blocks, both because the above object may more readily be attained, and a better articulation can be secured, not to speak of the close imitation of nature, as well as the greater artistic possibilities.

It is insisted, then, that to try in a set of teeth the trial-plate should be made of metal swaged on a die and counter-die, the same as if intended for metal work, and that the teeth should be secured to this plate with adhesive wax, so that they may not drop off at the slightest bite of the patient. In this way the operator can tell if the plate fits, if it adheres, and if the articulation is correct, before the case is proceeded with towards completion. Of course it is understood that the patient may not close his jaws firmly on a trial

set of teeth mounted as indicated; but he may do so sufficiently to enable the operator to determine the correctness of the articulation, the fullness, the contour, the length, and the expression, and to make such alterations for the better adaptation of the teeth as may be necessary.

Some years ago I asked the question whether vulcanite could be used on a silver plate with proper attachments if the plate were electro-gilded? A definite answer could not be given. Some thought it could; others did not know; still others had never tried it. I have tried it, and find that it does not do. The plate was pretty thickly coated with gold, but the affinity of the silver for the sulphur in the vulcanite seems to be so great that it acts through the gold film and leaves the vulcanite soft at the points of contact with the plate. It was unfortunate that this proved to be the case, as I had hopes that nice work could be thus constructed. I was not particularly partial to silver, only in so far as in the majority of cases this could be done for many persons whose means would not enable them to afford a gold plate.

On this subject I will say also that I have used aluminium plates with vulcanite to attach the teeth to the plate; but my idea is that it does not make what may be regarded as first-class work. Aluminium plate is readily swaged. It appears to be stiff, unyielding, and brittle; but this is not the case. To swage it, it must be annealed frequently. To anneal this metal it must *not* be heated red-hot like other metals; but it requires peculiar treatment. To anneal it for working, it is painted on both sides with oil, and then held in the blaze of a spirit-lamp. The oil will at a certain point of heat take fire, and the metal is held in the blaze with the tweezers until all the oil is burnt off. This treatment makes it sufficiently soft—it frequently done—to enable the workman to swage it very accurately on a zinc die and counter-die. It is adapted for upper dentures on account of its extreme lightness, as well as its conductivity of thermal change. But it is too soft, being easily bent out of shape; as well as unsightly in color, being similar to sheet zinc. It is considerably battered and bruised by the horn hammer in the initial steps of swaging, and considerable labor is required after the teeth are attached to it to remove these blemishes; and after all it is not susceptible of a high polish either by the buff-wheel or burnisher. Indeed, the burnisher cannot be used on it. The inability to solder this metal prevents attachments being united to it, so that the only way of making the vulcanite adhere to it is to "spur" it copiously with a sharp graver all over the surface where it is intended the vulcanite should be added to it, or to drill holes in the plate, and countersink these well to afford proper attachment.

Were it susceptible of being soldered, better work could be done with it, for it could be finally electro-gilded and made quite presentable; yet the fact remains that it is soft and easily bent, so that no subsequent finish would remove these defects, and consequently it cannot be regarded as eminently suited for dental plates, except in its qualities of lightness and conductivity.

For entire cases of artificial teeth a gold plate with vulcanite attachments is probably about the best. It far exceeds the same kind of plate with the teeth soldered on. It may be admitted that a gold plate with the teeth soldered to it is much stronger than where the teeth are united to the plate by means of rubber; but in reference to adaptability, contour, cleanliness, fit, articulation, and naturalness of expression, the latter is much preferable to the former. All dentists who have had any experience in plate work will testify that a plate may be swaged to fit the mouth very accurately, and when tried in before the teeth are soldered on will adhere well, will not rock or tip, and, though it be pressed at any point, it will fail to be dislodged. Yet the instant the teeth are soldered on, there is a change in the condition of affairs. The plate may adhere, or it may not rock or tilt, still there is a difference in the nature of the fit after to what there was before the teeth were soldered on. This can be accounted for in no other way than that the greater rigidity of the solder over the plate contracts, or expands, or warps this imperceptibly yet sufficiently to make a difference in the fit of the plate. To solder a case correctly we know that gradual, even, and thorough heating are necessary. The blast should only be directed against the solder at the last moment, when the case is so glowingly hot that the solder is ready to melt when the blaze is pointed at it. Yet, despite this care, and despite all a careful workman may do in close jointing and accurate fitting of the teeth and backings, I repeat that a plate never fits as well after the teeth are soldered on as it did before. In view of this, a gold plate with vulcanite attachments is strongly favored, as a case so constructed secures for the patient a better fit, a better articulation, a more cleanly substitute, a denture more amenable to prosthetic requirements, a more natural expression, and an ability to display artistic taste and skillful adaptation. If cleanliness were the only consideration, this should be paramount, as anyone will admit who has had to replace a broken tooth from a gold or silver plate, and who must have observed the filth of impacted food under and between the teeth and in the many places which serve as lodgment in work constructed in this way.

It follows then from the foregoing that silver plates will not make first-class work with vulcanite attachments, as the vulcanite will

not harden next to it, although the silver may be electro-gilded; that swaged aluminium plates make fairly good work, and are indicated on account of their lightness and conductivity, but contra-indicated on account of their softness, poor color, and inability to receive a high finish or be soldered; that better results can be secured by using metal plates with vulcanite attachments than with vulcanite alone; that plain teeth offer a larger field for artistic display and a closer imitation of nature than the gum-section teeth, as well as afford a better opportunity for the articulation of the artificial with the remaining natural teeth.

Discussion.

Dr. Essig. Dr. Chupein is mistaken when he says that teeth cannot be attached to silver plates by means of rubber. That combination has been successfully used for twenty-five years. It is of course necessary to interpose a thin sheet of tin between the rubber and the silver, this being done after the anchorages are soldered to the plate and before they are bent in hook form (see the DENTAL COSMOS for 1874, page 461). He also asserts that metallic plates do not fit as well after soldering the teeth on as they did before. Such is not necessarily the case, but all the parts to be soldered should be in contact, so that the minimum amount of solder may be used and the fusing done promptly. Any delay during the process of soldering which will allow one side of the denture to cool while the flame of the blow-pipe is directed on to the other side of it, will cause unequal expansion of the plate, and warping may follow.

There should be no necessity for Scotch-stoning the palatal surface of a vulcanite denture if the plaster model has as perfect a surface as plaster is capable of affording, and is coated with tin foil before vulcanizing; the rubber will be smooth and polished, and the adhesion of the tin foil so slight that it can be removed with the finger-nail.

Dr. Bonwill. Mechanics is the foundation of dentistry, and every dentist when young and having plenty of time should practice it. Even when his practice increases and he relegates the work to other hands, he should fit every plate himself and know that all parts of the work are done right. We cannot always furnish our patients with artificial plates of the material we would prefer them to have, since they must have the kind they are able to pay for. For this reason the majority must have vulcanite. I am convinced that the fear of being poisoned from wearing vulcanite plates is groundless. In all my experience I have never seen a case of it. Of course I have seen patients wearing vulcanite whose mouths were inflamed. I have known of cases where, the vulcanite plate being discarded and a gold plate substituted, the trouble disappeared and the gold

plate was worn with comfort; but in such cases the vulcanite plate was rough and was not kept clean, while the gold plate, being smooth, was easily kept clean. I am always careful to have vulcanite plates very smooth, both on the palatal and lingual surfaces, and for this purpose finish them with the Scotch stone, and I have not seen any more trouble result from vulcanite plates finished in this way than from gold plates. I had a case brought to my notice by a homeopathic physician. He had been treating the patient for eleven years, but could not cure her because she refused to give up her vulcanite plate. Upon making an examination of her mouth, I discovered that the plate had been made an inch too long, extending back and irritating the soft palate. I made her another vulcanite plate, properly fitted, which she wore with comfort and regained her health. As the vast majority of plates worn are vulcanite, it becomes our duty to understand the proper way of fitting and finishing them.

The essayist spoke of the impossibility of soldering aluminium. It can be soldered as readily as any other metal, and can be cast into the required shape as easily as Weston's metal. Its color, it is true, is objectionable, but as the metal does not show when in the mouth that is of little importance. I finish no plate until I try it in the mouth with the teeth on wax, so that any changes can then be made. The advantages of this course are so many and so important that I would not think of taking the risk of neglecting it. It is the only way you can assure yourself of the correctness of the bite, the articulation, and above all of the expression.

Dr. Bennett. The essayist has brought before us a subject which contains many debatable points. All materials used in prosthetic dentistry have good qualities as well as defects. This is strikingly true of the rubber used for base-plates. Many of these plates are too thick or too bulky in certain places, and most of them are improperly vulcanized, besides being rough, thus becoming constant and active irritants. Compare such work and its effects with the products of our best mechanical dentists, and anyone can see at a glance that in the first case the defects come literally to the surface, and in the other the good qualities. It may hurt our professional pride to make the admission, but I am inclined to think that much that would pass as dentistry would not be tolerated in any other art, though I fully believe that the performances of the best dentists will compare favorably with the products, for example, of the best gunsmiths and jewelers. But it is still true that much bad work is hidden in the mouth. Again, the dentist may do his part ever so faithfully, and the careless habits of the patient will defeat his best efforts. Irritation and congestion of the tissues under dental plates

are largely due to uncleanliness. Of course the mouth and the teeth are much harder to keep clean than the face and hands, but the former are not so open to inspection. Besides this, there are cases of an inherent predisposition to inflammation where neither good work nor cleanliness will prevent all trouble.

Vulcanite and amalgam occupy the same relative positions in the two departments of dentistry. Their easy working qualities have often injured the profession and imposed on the public; and yet in the hands of the competent and careful these materials can be so manipulated as to serve a good purpose.

As to impressions, I can add but little or nothing to what I have contributed to "The American System of Dentistry." All materials used for this purpose in undercut and in most partial cases, must either yield to some extent or fracture. Plaster is the best material *because it breaks.* It should be used for all upper dentures, or where suction is required. For some lower dentures modeling compound is at least as good. But the dragging or bending must be kept close to the teeth. To secure this I sometimes heat the surface of the impression slightly and return it to the mouth. In all cases the impression should be chilled with cold water in or on a napkin. It is a nice point to be able to tell just when it is hard enough.

As to trying in teeth, why go to either extreme? I can see no use in trying in partial sets, if the model and "bite" are good and true; but in other cases, where the *length* and fullness cannot be such "fixed points," it gives one a comfortable feeling to know that all is or at least was right.

The use of plain teeth with vulcanite has been advocated and gum teeth condemned. There are some reasons why the latter should be used in many cases, especially when the best suction that can be obtained is required. Of the two materials used, plaster and vulcanite, the latter is responsible for most misfits, assuming of course that the impression was perfect and the model properly prepared to exclude the air at the border of the plate. Such misfits are caused by warping of the plate due to unequal thickness, which also causes the rubber to draw away from the porcelain, thereby making a very filthy denture. The remedy is to make the plate as nearly uniform in thickness as possible. And the only way to secure this is to contour or fill up the depressions of the alveolar ridges, not with vulcanite alone, but chiefly with porcelain, the length of the tooth, and especially the width and thickness of the gum, being adapted to or ground to fit the depressions. A good rule is this: divide the strength of the rim between the porcelain and vulcanite, keeping the latter as nearly as may be of a uniform thickness. This may not require the use of gum teeth in every

case. I am aware that our most artistic mechanical dentists use plain teeth in nearly all cases. No kind of teeth can dispense with the necessity of careful filling of flasks, ample time for the plaster to harden, varnishing the cast with silicate of soda, just a little excess of rubber in packing, and vulcanizing with uniform time and pressure, not in water, but in steam. Don't pack the joints with anything. Grind them close the full thickness, and if the rubber does darken them a little, in a month or two this darkness will disappear.

Dr. Kingsbury. To my mind it is an unquestionable fact that a thorough knowledge of prosthetic dentistry is a *sine qua non* to every competent dentist. Without such knowledge he must be regarded as radically deficient in a very important branch of dental art. The student in dentistry should make himself master of all the various processes connected with the construction and adaptation of artificial dentures upon the different bases and methods, the utility and value of which have been tested by time and experience. The possession of such knowledge does not necessarily imply that he should personally with his own hands do the work of the mechanical dentist, except in special emergencies.

Although for many years I have devoted myself almost entirely to operative dentistry, yet it is my practice to take all impressions for artificial dentures, examine and trim the plaster models, fit the base-plates, take the bite, select size and shade of teeth, and also to try in the dentures before completion, that I may satisfy myself as to correctness of shade, articulation, expression, etc. By such a careful supervision and critical study of cases I not only avoid much subsequent trouble for myself, but also guard successfully against all just grounds for complaint on the part of my patients.

For securing the most perfect impression of the mouth in nearly all cases where there are no teeth remaining, I use quick-setting plaster of Paris. Where there are some teeth remaining, I frequently use pure beeswax in preference to plaster. I seldom fail to obtain a correct and satisfactory model in this way. Some persons have a strong aversion to the use of plaster, even for full dentures. In such cases I think we should substitute wax or the modeling composition. When the plaster model is made I examine it critically, and make such slight alterations as I think advisable. It is in some cases a good thing to remove a thin layer of the plaster model so as to deepen the palatine arch slightly at that point where the base-plate will extend back and terminate near the soft palate. The base-plate should be so constructed as not to rest hard against or even to touch the central portion of the hard palate save only two or three lines in width at the extreme posterior part or edge

of the plate. For many years I have used gold plates with rubber attachments for the teeth. My experience with such dentures as a general rule has been most satisfactory. Where failures have occurred in this style of denture I think they have been the result of an insufficient number of staples, loops, hooks, or pins securely soldered to the gold plate, or to weakness of the plate allowing it to spring, so that the hard rubber has loosened at the edges and the fluids of the mouth have found entrance and become offensive. Such conditions should be prevented by the use of more loops and staples and thicker plates.

I am somewhat surprised to hear Dr. Bonwill state that he had never seen a case where the patient suffered from the bad effects of rubber dentures. Many cases have come under my observation, and some cases have occurred in my own practice. I know that opinions differ as to the exciting cause. While it is considered by some as due to the coloring material, sulphuret of mercury, or to some other constituent of the dental vulcanite, others claim that the deleterious action upon the mucous membrane is due to the non-conductive nature of the base-plate, or to its rough irritating surface, and the want of proper care on the part of the patient in keeping the denture clean.

Some strongly pronounced cases of my own, where the use of the red rubber has produced serious consequences and the substitution of black rubber has proved perfectly innocuous, have led me to the conclusion that the vermilion or some other chemical constituent in the ordinary red rubber must be the exciting cause of the peculiar pathological condition in such cases. Furthermore, I think there can be no doubt as to some persons having a special diathesis rendering them more than ordinarily susceptible to the action of certain medicinal and chemical agents.

In regard to the warping of gold plates, if you will turn back in the dental journals to the period of twenty years ago or so, you will find this subject very fully discussed. The method best of all others for preventing this perplexing difficulty is to place the denture on a piece of fire-proof slab, such as is used for fusing porcelain teeth, in the muffle of an ordinary dental furnace, with a net-work of wire of a semi-circular form made fast to the slab by passing the wire through perforations in the same, and then invest the denture in a mixture of plaster, sand, and asbestos, heat up in a furnace nearly to the soldering point, and then bring it under the action of the blowpipe and solder at once. A gold or silver plate treated in this way will be found to fit the model as well or nearly so as before soldering.

Dr. Ottolengui. If you will examine the modeling composition as it comes from The S. S. White Dental Manufacturing Co., you

will find that each cake of it is a beautiful impression of the mold in which it is pressed, and impressions of the mouth can be taken just as sharp and perfect as the impressions of the mold, and just as good for the purpose as any plaster impression, and except in cases of deep undercuts I think better. Even in cases of deep undercuts, if rightly manipulated, there is no danger of its being drawn out of shape. The material must be carefully pressed into position and allowed to remain there until it is as hard as it is when cold. This will take from ten to twelve minutes.

Dr. Bennett. Do you always leave it in ten or twelve minutes?

Dr. Ottolengui. Yes, and by the watch.

Dr. Bennett. Does not the patient object to so long a time?

Dr. Ottolengui. Not if told that it is necessary to secure a fit.

Dr. Essig. I cannot imagine how any dentist can give preference to other materials for taking impressions when plaster enables him to meet every difficulty with greater precision than can be obtained with wax or modeling compound.

Dr. Bennett. I think I have tried all published methods, besides others, for taking partial impressions with plaster; and while I claim a good share of success with all of them, I have in some cases encountered obstacles which candor requires me to say I did not completely demolish by merely "taking thought." In cases where the teeth are broad or thick-crowned, with depressed sides or denuded necks, there are points of difficulty that command one's respect and try his skill. It is easy enough to oil and remove the cup, break away the rim, and even remove the palatal part by a wide groove cut back through the center, but the pieces between the teeth are rather numerous when removed, even when carefully grooved transversely.

Dr. Faught. I agree with Prof. Essig in his estimate of plaster. I have seen, however, impressions properly prepared and the plaster properly mixed and yet a poor cast produced, the impression being ruined by the manner in which the plaster was introduced into it. Before the introduction of the plaster for the cast the impression should be immersed in cold water. I am in the habit of taking impressions of the teeth for the purpose of getting exact casts of the cusps, and in making the cast I use a camel's hair brush, to be sure that the almost hair-like depressions will be reproduced. If I only poured in the plaster, it would not enter the fine places.

Dr. Essig. Dr. Faught will concede that a reasonable amount of care is needed in every stage of the laboratory work. I did not go into the minor details of the work of running impressions and separating impressions from models, as I would before a class of first-year students.

The standard of mechanical dentistry is not as high as it was in 1858, and rubber work is as crudely done now as it was then, and while, in the numerous applications to which rubber has been put in the industrial arts, it has been carried to a great state of perfection, nine-tenths of the rubber dentures we see bear the impress of the amateur rather than that of the skilled professional workman; and this condition of things is due to the absence of systematic and thorough training.

I do not agree with Dr. Kingsbury in attributing the irritation of the mucous membrane when rubber dentures are worn to sulphide of mercury. Roughness of the surface of the denture, or its non-conductibility, or both, usually cause the trouble.

Dr. Bonwill. I want to say a word to Dr. Bennett in regard to gum teeth. I do not consider them in any case preferable to plain teeth, because they invariably form places for the lodgment of food and other débris from which it cannot be removed by ordinary means. I have never had to repair a case that was not absolutely disgusting. Paraffin wax run around the necks of the teeth will exclude secretions and moisture. This is one of the most important things to insure the perfect cleanliness of every kind of plate. It prevents capillary action, and when so used on a metal plate the latter can be resoldered and afterward the wax run in around the joints. It can also be used on rubber plates. It is indestructible, and has no taste whatever.

Dr. James Truman. There is one point in connection with the action of rubber plates on the mucous membrane that has not been alluded to in this discussion, and that is the possible influence of micro-organisms in producing inflammation. During the active life of the late Prof. Wildman, this action of red rubber was one of many subjects that his investigating mind attempted to solve. He and I made extended observations, both chemically and microscopically, and came to the conclusion that free mercury could be found in plates, but in a state of such minute subdivision that in a body as impervious as vulcanized rubber it would be perfectly innocuous; that the cause of the inflammation must be looked for elsewhere; and the decision arrived at then was that roughness, lack of conductivity, and uncleanliness were the combined causes of trouble. Since that time the germ theory of disease has been recognized, and now very properly, through the investigations of Black, micro-organisms must be regarded as the principal factor. So thoroughly have I become convinced of this that I recommend as a wash a powerful antiseptic. In cases examined where this has been faithfully used, the mucous membrane is as free from inflammation as under a gold plate. The question, therefore, seems to have resolved itself into

two conditions,—thorough freedom from roughness and absolute cleanliness.

Dr. Tees. The most certain way of obtaining an accurately fitting rubber plate is to vulcanize it upon a cast made from a swaged pure silver plate, which if necessary can be manipulated, by means of a burnisher, while in the mouth to a proper adaptation to the hard and soft parts. We have all seen badly inflamed conditions of the mucous membrane in appearance resembling raw beef, where rubber plates are worn; but I agree with Prof. Essig that it is not due to the coloring matter, but rather to the non-conductivity of the substance, and also to the lack of cleanliness. I have seen the same condition of the gums under gold plates in the mouths of people who have not a proper regard for cleanliness. I find the healthiest looking gums are those of patients who clean their plates and place them in water during the night. Next to continuous-gum work, the best dentures are those made of gold plate with the teeth attached by means of vulcanized rubber.

Dr. Chupein. I wish to say that I fully agree with Dr. Essig that a gold plate must be soldered quickly, but yet, no matter how carefully the work is done, the plate will not fit as well after as before soldering. As to rubber sore mouth, I have long been convinced that it is due to uncleanliness, and not to any chemical action of ingredients in the rubber.

Dr. Ottolengui. I was invited to come here this evening and give my methods of filling teeth in cases of sensitive dentine. It had been my practice in such cases to give gas before operating; but one day a lady came to my office to have a tooth filled, and I found it so sensitive that I could not touch it: at my very first attempt she fainted, and as she would not take gas I could not go on and had to let her go home. After she had gone I said to myself, What is the reason the dentine is so sensitive, and what means can I use to lessen the pain of operating in such cases? Of all the different things I had tried or heard recommended, chloride of zinc and hot air were those which gave the best results, and I tried to think what it was they had in common. I reasoned that when the chloride of zinc crystals are put into a cavity, they draw the water from the tubules, and that the hot air would do this same thing. This I thought would cause the fibrils to contract into the tubules so far that they would not be touched by the excavator in preparing the cavity. My idea was that the tubules were straight pipes, and I did not know then that many of them were forked in such a way that the fibrils could not be contracted far. Then I thought, if I can dry the moisture out of these tubules and cause the fibrils to

contract, the pain will not occur. So I concluded to fill the cavity with absolute alcohol; then with a chip-blower force hot air in until it was evaporated dry, and for the purpose of contracting the fibrils I could think of nothing better than the ether spray. I wrote the lady that I had a method of operating painlessly, and when she came to my office I told her that I thought she would feel some pain from the ether, but that she would not feel the cutting of the tooth. The operation was an entire success; the suffering from the ether-spray was trifling, and the operation of preparing and filling the cavity entirely painless.

This was my first case, and since then I have proceeded in the same way with over fifty cases, and have not had a failure. There was one case in particular I wish to speak of,—one of arrested decay which was very acutely painful. I subjected it to this treatment, and it was an entire success. In such cases as the one at the clinic this afternoon, where the sensitiveness is around the whole tooth, and the cavity is not a crown cavity, I proceed as before stated, using the hot air; then the ether spray; then I take a gold finishing bur and cut away the diseased and broken-down dentine. These burs will not cut sound dentine, and you can use them freely, and the effect of the treatment will continue until the filling is finished. I have operated so often without failure that I am satisfied of its invariable usefulness.

I do not believe now, as I did at first, that this operation obtunds the pain because the fibrils contract and thus escape the touch of the excavator and drill used in preparing the cavity, for I have drilled so deep that this will not explain it. The freezing of the parts by the ether-spray seems to be the cause.

Another point. I have been asked about the effect of this treatment on the pulp. Shortly after I was convinced of its success I had a case of an exposed pulp which I tried to anesthetize so that I could take it out, but did not succeed. I then capped the pulp and filled over it, and it is still alive, which I know because the tooth is sensitive to cold.

I would like you to test this method, and I don't think you will have any trouble if you follow my plan correctly. I use the hot air for three minutes by the watch, and in special cases for four minutes, and keep up the ether-spray till the patient is quiescent. About one-third of the patients will complain of pain from the ether. I consume from four to five minutes in the whole operation of rendering the tooth anesthetic and preparing the cavity.

Dr. Tees. Do patients become affected by the ether?

Dr. Ottolengui. I do not think that they do in any case.

Dr. Kingsbury. The treatment of Dr. Ottolengui's for obtunding

sensitive dentine may possess a special merit of its own. Yet it may be a question whether it has much advantage over the application of chloride of zinc in the deliquescent state for the same purpose. Its application on a small pellet of cotton or bibulous paper while excavating the carious cavity for a few minutes—say three to five—will in almost all cases obtund the most sensitive dentine to a degree to render its excavation nearly if not quite painless. At the instant of application a painful impression is produced, but it soon ceases. It seems that a similar or even more painful sensation follows the ether-spray. A convenient and perfect local obtunder of sensitive dentine is a desideratum up to the present time, and the man who shall discover it will confer a boon upon the dental profession and the world.

Incidents of Practice.

Dr. James Truman. I wish to call your attention to a paper disk-holder, the invention of Dr. O. W. F. Holbrook, of Newark, N. J. It is worked by a spring, and seems to be exceedingly convenient for the purpose, the changes being easily made. It requires, however, a special disk.

I also have here some samples of floss silk from John D. Cutter & Co., New York. This has some special advantages, worthy of your notice.

Ambler Tees, D.D.S., *Recording Secretary.*

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

Meetings of the First District Dental Society of the State of New York will hereafter be held in the Hall of the New York Academy of Medicine, No. 12 West Thirty-first street, New York City, beginning with the May meeting, on the first Monday of each month (excepting July, August, and September), at 8 o'clock P.M.

The clinics of the society will be held as usual at the depot of The S. S. White Dental Manufacturing Co., Nos. 767 and 769 Broadway, corner Ninth street,—on the first Monday, however, instead of the first Tuesday of each month as heretofore.

The following resolution was passed by the society at its annual meeting, held April 3, 1888:

Resolved, That this society extend thanks to The S. S. White Dental Manufacturing Co. for having so generously given to the society, for a number of years past, the free use of the rooms in which its meetings have been held.

B. C. Nash, D.D.S., *Secretary.*

HARRIS DENTAL ASSOCIATION.

THE twenty-first annual meeting of the Harris Dental Association was held at Lancaster, Pa., on Thursday, May 3, 1888.

The following officers were elected for the ensuing year: E. M. Zell, president; D. R. Hertz, vice-president; P. W. Hiestand, treasurer; Wm. N. Amer, secretary; J. S. Smith, D. R. Hertz, and A. W. Rogers, delegates to the State society.

WM. N. AMER, *Secretary*, Lancaster, Pa.

SOCIEDAD DENTAL DE COLOMBIA.

THE Sociedad Dental de Colombia—organized February 28, 1887—held its first annual meeting at Bogotá (U. S. of C., S. A.), on the 25th of February, 1888.

The following officers were elected for the ensuing year: A. Salcedo A., D.D.S., president; Dr. Rafael Tamayo, vice-president; Guillermo Tavera H., D.D.S., secretary; G. Vargas Paredes., D.D.S., treasurer.

This society holds two regular meetings each month, and has for its organ the *Revista Dental*, a monthly journal devoted to the interests of the profession.

NEW HAMPSHIRE DENTAL SOCIETY.

THE twelfth annual meeting of the New Hampshire Dental Society will be held in Concord, June 19, 1888, convening at 11 o'clock.

Efforts are being made to make this meeting the best ever held by the society, and all dentists of the State are earnestly requested to be present.

The Board of Censors will meet at 7 o'clock P.M., June 18, for the examination of candidates for license to practice in the State.

E. B. DAVIS, *Secretary*,
88 N. Main St., Concord, N. H.

WISCONSIN STATE BOARD OF DENTAL EXAMINERS.

THE next regular meeting of the Wisconsin State Board of Dental Examiners will be held in Milwaukee, July 19 and 20, 1888.

The board is now constituted as follows: Charles C. Chittenden, president, Madison; B. G. Marcklein, Milwaukee; F. L. Dolbeare, Oshkosh; E. C. French, Eau Claire, and Edgar Palmer, La Crosse. Dr. Dolbeare succeeds the late Dr. Reynolds, and Dr. Palmer's commission was renewed May 2, 1888, for five years.

EDGAR PALMER, *Secretary*, La Crosse, Wis.

INDIANA STATE DENTAL ASSOCIATION.

The thirtieth annual meeting of the Indiana State Dental Association will be held at Terre Haute, commencing Tuesday, June 26, 1888. All dentists are cordially invited to attend.

The State Board of Dental Examiners will also meet at the same time and place.

R. W. Van Valzah, *Secretary*, Terre Haute, Ind.

DENTAL COLLEGE COMMENCEMENTS.

UNIVERSITY OF PENNSYLVANIA—DEPARTMENT OF DENTISTRY.

The ninth annual commencement of the Dental Department of the University of Pennsylvania was held, in connection with that of the Medical Department, at the American Academy of Music, Philadelphia, on Tuesday, May 1, 1888, at 11 o'clock A.M.

The valedictory address was delivered by John Ashhurst, Jr., M.D., professor of clinical surgery.

The number of matriculates for the session was one hundred and twenty-three.

The degree of D.D.S. was conferred on the following graduates, by William Pepper, M.D., LL.D., provost of the university:

NAME.	STATE.
Arturo Aguilar	Nicaragua.
Hugo Ascher	Germany.
Percy C. Ayres	Pennsylvania.
Boyd H. Baker	Pennsylvania.
Ira G. Baumgardner	Pennsylvania.
Harry M. Beck	Pennsylvania.
J. Ferris Belt	Delaware.
Elmer E. Bower	Pennsylvania.
George A. Bowers	New Hampshire.
Frederick W. Brown	Connecticut.
William E. Bryant	Minnesota.
John J. Burke	Pennsylvania.
Gabriel C. Cabedo	Spain.
William C. Channell	Iowa.
Arthur W. Cogswell	Nova Scotia.
George T. Cornelius	Pennsylvania.
J. Edward Dunwoody	Pennsylvania.
Henry H. Fenn	Connecticut.
Charles R. Fletcher	Nova Scotia.
Thomas B. Fuller	New York.
Peter W. Gardner	Wisconsin.
R. Hornsby Gibbons	England.
Mark W. Graff	Indiana.
Frank J. Hart	Pennsylvania.
Hans von der Heyde	Turkey.
Richard S. Hopkins	Wyoming Ter.
Charles P. Howard	Illinois.
J. Benjamin Jones	Pennsylvania.
William B. Keyes	Brazil.
Hans Ludwig Knod	Germany.
Harry W. Kuni	Pennsylvania.
Harry W. Le Fevre	Ohio.
Edward G. Link	New York.
August Lohmann	Germany.
Horace McCanna	Pennsylvania.
W. Archie McDaniel	Alabama.
John F. Manship	Delaware.
William J. Mayer	Connecticut.
Louis C. J. Meisburger	New York.
James L. Paiste	Pennsylvania.
Eugene H. Place	Illinois.
Harry M. Ramsden	Pennsylvania.
Chauncey M. Rathbun	New York.
Will B. Robinson	Ohio.
Samuel F. Rue	New Jersey.
Paul Schwarze	Germany.
Albertus V. Segar	Rhode Island.
Charles E. Smith	New Hampshire.
George A. Sullivan	Pennsylvania.
Louis F. Tees	Pennsylvania.
Robert C. Tenny	New York.
Lamar I. Thompson	New York.
George L. Van Deursen	Illinois.
Luther M. Weaver	Pennsylvania.
Nathan Weinberg	Kansas.
Walter F. Wheeler	Massachusetts.

NATIONAL UNIVERSITY—DENTAL DEPARTMENT.

The fourth annual commencement of the Dental Department of the National University was held, in connection with that of the Medical Department, at the Congregational Church, Washington, D. C., on Wednesday, May 2, 1888.

The annual oration was delivered by the Hon. Arthur McArthur, vice-chancellor of the university; the address on behalf of the faculty to the graduates by Professor J. Morrison, M.D., Ph.D.; and the valedictory address by J. Wilson Davis, D.D.S.

The degree of D.D.S. was conferred on the following graduates of the dental class by the President of the United States, Grover Cleveland, chancellor of the university:

NAME.	STATE.
A. A. Anderson	Pennsylvania.
Arthur H. Baker	Minnesota.
George M. Beckett	New Jersey.
Jesse M. Campbell	Missouri.
S. J. Cockerille, Jr.	Dist. of Col.
J. Wilson Davis	Dist. of Col.
John A. Drawbaugh	Pennsylvania.
Robert J. Hyatt	Dist. of Col.
Joseph M. McDonald	New York.
Samuel F. Newton	Dist. of Col.
W. J. Reynar	Canada.
Jesse B. Rutherford	Pennsylvania.
W. A. Van Norden	Austria.

EDITORIAL.

DENTAL COLLEGE ANNOUNCEMENTS.

We would be glad to receive at the earliest convenient date copies of the announcements for the coming sessions of each of the dental colleges in America. We have almost constant inquiries, from our own and foreign countries, with reference to the *personnel* of the staff of various colleges and kindred matters, answers to which would often be facilitated by our possession of official information. Some of the colleges favor us regularly. We wish all of them to do so.

WASHINGTON TERRITORY DENTAL LAW.

Following is the text of "An act to regulate the practice of dentistry and to protect the people against empiricism in relation thereto in the Territory of Washington:"

Be it enacted by the Legislative Assembly of the Territory of Washington:

Section 1. That from and after the passage of this act it shall be unlawful for any person to engage in the practice of dentistry in the Territory of Washington unless said person has graduated and received a diploma from the faculty of a dental college, chartered under the authority of some one of the United States or foreign governments, or shall have obtained a certificate from a board of dentists, duly authorized and appointed by the provisions of this act to issue such certificate.

Sec. 2. That a Board of Dental Examiners, consisting of five practicing dentists, be hereby created, whose duty it shall be to carry out the purposes and en-

force the provisions of this act. The members of said Board of Dental Examiners shall be appointed and commissioned by the Governor of the Territory. Their terms of office shall be for two years, and until their respective successors shall be duly appointed and commissioned. All vacancies occurring in said Board of Examiners may be filled by the Governor at any time. The said Board of Examiners shall be appointed by the Governor on or before the first Monday in February. The term of office shall begin the first Monday in March, excepting that the term of the first board shall begin from the time they are appointed and commissioned. Each member of said board shall take the following oath before entering upon the duties of said office:

TERRITORY OF WASHINGTON, } ss.
County of............... }

I, ..., do solemnly swear that I will support the Constitution and laws of the United States of America and the laws of Washington Territory and the organic act thereof, and that I will faithfully perform the duties of the office upon which I am about to enter, so help me God.

[SIGNED] ....

SEC. 3. Said board shall choose one of its members president and one the secretary thereof, and it shall meet at least once in each year, or oftener, at the call of any three members of said Board. Thirty days' notice must be given of the time and place of meeting of said Board, said notice to be mailed to all practicing dentists in the Territory. Three members of said board shall constitute a quorum, and the proceedings thereof shall, at all reasonable times, be open to public inspection.

SEC. 4. Within three months from the time this act takes effect it shall be the duty of every person who is, at the time of the passage of this act, engaged in the practice of dentistry in this Territory, to cause his or her name and residence, or place of business, to be registered with said Board of Examiners, who shall keep a book for that purpose. The statement of every person shall be verified under oath, before a notary public or justice of the peace, in such manner as may be prescribed by the Board of Examiners. Every person who shall so register with said board as a practitioner of dentistry shall receive a certificate to that effect and may continue to practice as such without incurring any of the liabilities or penalties provided in this act, and shall pay the Board of Examiners for such certificate a fee of two dollars and fifty cents.

SEC. 5. Any and all persons who shall so desire may appear before said Board at any of its regular meetings and be examined with reference to their knowledge and skill in dental surgery, and if the examination of any such person or persons shall prove satisfactory to said board, the Board of Examiners shall issue to such persons as they shall find to possess the requisite qualifications to practice dentistry a certificate to that effect, in accordance with the provisions of this act. Said board shall also indorse as satisfactory diplomas from any reputable dental college, when satisfied with the character of such institution, upon the holder furnishing evidence satisfactory to the board of his or her right to the same, and shall issue a certificate to that effect upon the payment of two dollars and fifty cents to said board for said certificate. All certificates issued by said board shall be signed by its officers and stamped with the seal of said board, and such certificates shall be *prima facie* evidence of the right of the holder to practice dentistry in the Territory of Washington.

SEC. 6. Any person who shall practice dentistry contrary to the provisions of this act shall be deemed guilty of a misdemeanor, and, upon conviction, may be fined in any sum not less than fifty dollars nor more than two hundred dollars, or be confined for any period not exceeding six months in the county jail, for

each and every offence. All fines recovered under this act shall be paid into the common school fund of the county in which the conviction is had.

SEC. 7. In order to provide the means for carrying out and maintaining the provisions of this act, the said Board of Examiners shall charge each person applying to or appearing before them for examination for a certificate of qualifications a fee of twenty-five dollars, which fee shall in no case be returned, and out of the funds coming into the possession of the board from the fees so charged the sum of five dollars for each day actually engaged in the duties of their office and all legitimate and necessary expenses incurred in attending the meetings of said board. Said expenses shall be paid from the fees and penalties received by the board under the provisions of this act, and no part of the salary or expenses of said board shall be ever paid out of the Territorial Treasury. All moneys received in excess of salaries and expenses, as above provided for, shall be held by the secretary of said board as a special fund for meeting the expenses of said board and carrying out the provisions of this act, he giving such bond as the board may from time to time direct; and said board shall make an annual report of its proceedings to the Governor on or before the 15th day of October of each year, together with an account of moneys received and disbursed by them pursuant to this act.

SEC. 8. Any person who shall receive a certificate from said board to practice dentistry shall cause his or her certificate to be registered with the County Auditor of the county in which such person may desire to engage in the practice of dentistry, and the Recorder of Deeds in the several counties in this Territory shall be entitled, for registering such certificates, a fee of one dollar. Any failure, neglect, or refusal on the part of any person holding such certificate to register the same with the Recorder of Deeds, as above directed, for a period of six months, shall work a forfeiture of the certificate; and no certificate, when once forfeited, shall be restored, except upon payment to said Board of Examiners of the sum of twenty-five dollars as a penalty for such neglect, failure, or refusal.

SEC. 9. Any person who shall knowingly and falsely claim, or pretend to have, or to hold, a certificate of license, diploma, or degree granted by any society, or who shall falsely, or with intent to deceive the public, claim or pretend to be a graduate from any incorporated dental college, shall be deemed guilty of a misdemeanor and shall be liable to the same penalties as provided in section 6 of this act.

SEC. 10. Any two members of the Board of Examiners shall issue a temporary certificate to any applicant upon the presentation by such applicant of the evidence of the necessary qualifications to practice dentistry. Such temporary certificate shall remain in force until the regular meeting of said board occurring next after the date of such temporary certificate, and no longer; but such temporary certificate shall not be granted by any two members of said board after said board has rejected the applicant. All members of said Board of Examiners shall, at each regular meeting of said board, make a report of such temporary certificates issued by them.

SEC. 11. This act shall take effect and be in force from and after its passage and approval.

Passed by the Council, January 24, 1888.

JOHN R. THOMPSON, *President of the Council.*

Passed the House January 27, 1888.

W. M. CLARK, *Speaker of the House.*

Approved January 28, 1888.

EUGENE SEMPLE, *Governor.*

The Board of Examiners appointed by the Governor under the provisions of this act is constituted as follows: Drs. E. C. Kilbourne, Seattle; F. P. Hicks, Tacoma; A. McCully, Tacoma; P. H. Carlyon, Olympia; and E. Pittwood, Spokane Falls.

BIBLIOGRAPHICAL.

Lectures on Certain Diseases of the Jaws. Delivered at the Royal College of Surgeons of England, 1887. By Christopher Heath, F.R.C.S., Hunterian professor of surgery and pathology in the college, etc. Sixty-four illustrations. Octavo, pp. 128. Philadelphia: P. Blakiston, Son & Co., 1888. Price, $1.00.

Mr. Heath's reputation as a general surgeon and the special attention which he has long given to the surgical diseases of the jaws render any publication by him on this subject extremely interesting. The greater part of the material contained in the present little book is to be found in the author's original essay on the same subject which took the Jacksonian Prize of the Royal College of Surgeons of England in 1867, and has since gone through various editions. We recognized at once many of the excellent plates and much of the text, and find on glancing through the book that Mr. Heath's teachings have been little if at all modified, but, as they were always well founded, this is not to be wondered at. We know of no other volume in the English language, treating of the diseases in question, which within the same compass contains such sound teaching based on such ripe clinical experience.

Accidents and Emergencies: A Manual of the Treatment of Surgical and other Injuries in the absence of a Physician. By Charles W. Dulles, M.D., fellow of the College of Physicians of Philadelphia, etc. Third edition, revised and enlarged, with new illustrations. 119 pp. and index. Philadelphia: P. Blakiston, Son & Co., 1888. Price, cloth, 75 cents.

The little volume before us contains simple and practical suggestions for the treatment of the various emergencies to which humanity is liable,—sprains, dislocations, fractures, wounds, etc. The information is such as all intelligent persons ought to possess to enable them to do properly what may be done in such cases before the arrival of a skilled physician.

Quiz Compends, No. 4: A Compend of Human Physiology. Especially adapted for the use of medical students. By Albert P. Brubaker, A.M., M.D., demonstrator of physiology in the Jefferson Medical College, etc. Fourth edition, revised and enlarged. With illustrations and a Table of Physiological Constants. 169

pp. and index. Philadelphia: P. Blakiston, Son & Co., 1888. Price, cloth, $1.00.

This compend is a compact and convenient arrangement of the fundamental facts of human physiology. That it has met the needs of students is evidenced by the call for a fourth edition.

OBITUARY.

CHARLES W. STEARNS, M.D.

Dr. Charles W. Stearns, the well-known writer, died at Longmeadow, Mass. on last Thursday, in his seventieth year. He was born at Springfield, Mass., and was graduated from Yale College in 1837, after which he studied medicine at the Harvard Medical School and took his degree of doctor of medicine at the University of Pennsylvania in 1840. He began practicing at Springfield, but soon became a surgeon in the army, and served in Florida and New York harbor in 1841-42. After spending a few years in Europe, he became surgeon of the Third Regiment of New York Volunteers, and during the war was at different times at Fort McHenry, Baltimore, at Suffolk, Va., and at Fortress Monroe. He was married three times, and leaves a widow, but no children. Dr. Stearns was a man of scholarly habits, and at one time was a devoted Shakesperian student. He published before 1860 several works on surgical and physiological subjects. Some of his later works were "Shakespeare's Medical Knowledge," "The Shakespeare Treasury," "Concordance and Classified Index to the Constitution of the United States," "Analytical Index to Shakespeare's Plays," and a novel and two plays. The "Concordance" is considered complete and thorough, and has been adopted as a text-book in several institutions. It is also generally accepted as authority by lawyers and legislators.

The above was published in the New York *Tribune* of September 14, 1887. The death of Dr. Stearns deserves from the medical and dental professions something more than a passing notice. Dr. Stearns' life commenced about seventy years since, badly handicapped by a deformity of the palatine fissure (with very little, if any, hope of being helped by the surgeon or dentist), and few of our dentists know with what skill and perseverance he struggled to overcome the difficulty which beset his life. His great aim was to perfect his speech and remove this great impediment. Without power to express his thoughts in a clear, pure tone, either in his family circle or in the refined and cultivated society which surrounded him, we can well imagine the mortification which led him to choose a life of scholarly habits, and devote much time to study and invention, in the hope of finding some remedy for his misfortune. At twenty a graduate of Yale; at twenty-three he had a medical diploma, and five years later was in London presenting to eminent medical authorities there his methods of correcting cleft palate with mechanical appliances.

Eminent men in Paris and London recognized his achievements, and advised him to make a specialty in medical practice. This was in August, 1845 (*vide London Lancet* of that month). Dr. Stearns was able to put himself on record in this department at this early date in the use of vulcanizable rubber as a material, and to him belongs the priority of this discovery, so clearly that the dental profession made no claims to it in the compilation of its literature on this subject up to the centennial year of 1876. Dr. Stearns. however, early discovered that plastic surgery was but partially successful in treating cases of palatine fissures by staphylorraphy, nor could ordinary surgeons do it at all by the new method, because incapable and unfitted by want of mechanical skill and experience to undertake the construction and introduction of such appliances. So he very wisely turned his attention to the dental surgeon as being better qualified to furnish the elaborate and difficult mechanism requisite to the wants of the cleft-palate patient. Hence, on his return to America, we find him offering the opportunity to dentists who might wish to perfect themselves in this important department of science, to consult him at No. 95 Cliff street, New York, for that purpose. (See *Vulcanite*, Vol. I, page 71, August, 1860.) A number of our dentists did avail themselves of this privilege, becoming thus more familiar with his plans and ideas, and have ever since been able to hold leading positions in this department. His generosity in giving freely his hard-earned experience to the dental profession in the interest of unfortunate cleft-palate patients deserves our sincere thanks and gratitude. J. A. B.

HINTS AND QUERIES.

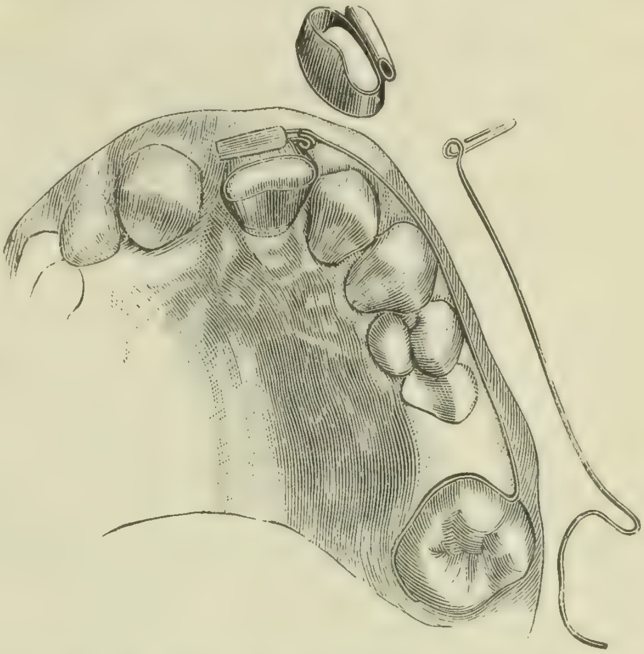
AN IMPLANTATION FAILURE.—A gentleman thirty-eight years of age came recently under my professional care, and I learned from him that early in May, 1886, a dentist resident in San Francisco had implanted in the inferior maxilla on the right side two bicuspids to replace two which he had lost in the late Franco-Prussian war. The implanted teeth soon became firm, but after three months or thereabouts one of the teeth loosened and fell out. The other I removed on the 6th of March, 1888. Thus, in less than two years, the

operation proved a failure in a subject whose bodily health and vigorous physique were peculiarly favorable for the experiment of implantation. The accompanying cut of the removed tooth shows that decalcification began at the point of weakest pericemental contact, and proceeded downward and inward to the root-filling of gutta-percha. The tooth is to be subjected to examination under the microscope by an expert, who will report upon its histological aspects.

It may be assumed that in no case is implantation advisable, because in no instance can life be infused into the dried and perished membrane, and at its best the operation can subserve but a temporary purpose, which could equally well be accomplished by the use of suitable porcelain teeth with roots. These roots, if

properly fitted and ribbed and adapted to accurately fit corresponding sockets made by conforming instruments, would probably be retained by encapsulation for a longer time than the natural roots, because not like them subject to resorptive action, nor likely to incite disorder by an irritative action of the resultant débris upon the surrounding vital tissues. There seems, however, to be no probability that, in any of its phases, implantation will result otherwise than in a final failure. —A. P. MERRILL, D.D.S., San Diego, Cal.

REGULATING DEVICE.—For rotating a tooth, the most efficient contrivance is the combined lever and collar, fitting and fixed upon the tooth by cement. The soldering of a flattened tube across the face of the collar affords a means for the insertion and removal of the lever at will.



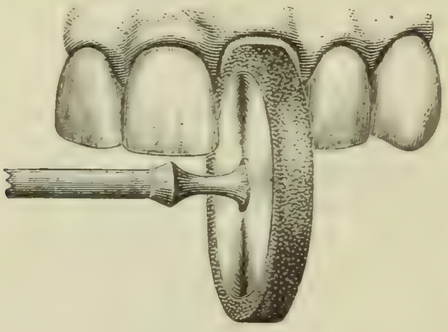
I prefer a lever made of a piece of thin piano-wire, No. 27, U. S. gauge, one end of which is folded upon itself for about a quarter of an inch, and the wire then coiled once or twice close to the folded end (see illustration). The other end is bent to hook around a molar or other posterior tooth. The illustration shows such a tubed collar and wire lever separately, and also in place on the tooth which is to be rotated. It is obvious that the lever can be removed or applied without detaching the cemented collar. In operation, the compound lever effects a complex movement of the tooth which is being rotated by the lever as a whole, and is at the same time thrown outward by the hinge-like action of the short lever turning on the coil as on an axis—the result being the proper alignment of the tooth, *if* the spring of the coil and the elasticity of the lever are so judiciously combined as to be adapted to the requirements of the case in hand.

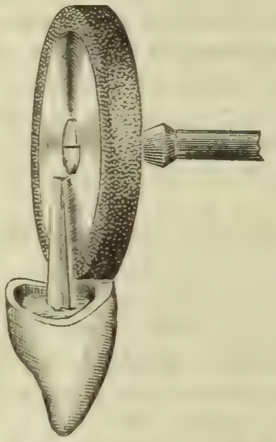
The other central incisor could likewise be simultaneously rotated, and, after both teeth had been brought into position, a folded wire bar through both tubes would retain them in place so long as might be deemed desirable.—E. S. TALBOT, M.D., D.D.S., Chicago, Ill.

PAINLESS DEVITALIZATION OF THE DENTAL PULP.—In the DENTAL COSMOS for February, page 107, Dr. James Truman says, "It is well known that it has been impossible to devitalize with arsenic a pulp in a highly-inflamed condition without excessive pain to the patient." About three years ago I made many experiments with arsenic, in combination with various adjuvants, in the endeavor to devitalize without pain. After a few months I settled upon the following mode of practice, which afforded pleasing results: Giving careful attention to the preliminaries of thoroughly cleansing the cavity, I take in the foil-carrier a very small pledget of cotton, saturate it with benzole, put on the cotton a very little of the S. S. White nerve-paste, and carefully place the pledget directly upon the exposed pulp. I then loosely pack the cavity with cotton, and saturate this with sandarac varnish. During the past six months I have used a solution of caoutchouc in benzole with still greater satisfaction, for this solution causes the pledget to stay where it is put, and so insures the immediate action of the arsenic without

the risk of inadvertently displacing the pledget in packing the cotton and sandarac. I have no theory in explanation of the absence of pain, but the method has been so uniformly successful that I submit it for trial by the profession.—JAMES GORDON, St. Thomas, W. I.

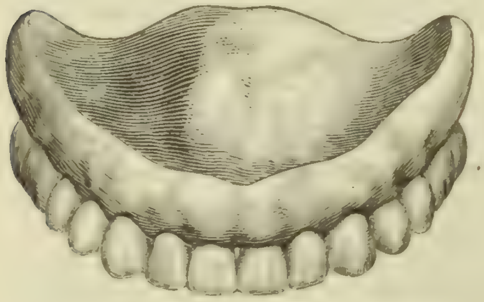
SAFE-SIDE CORUNDUM WHEEL.—For grinding Logan crowns without marring the pins, a stump wheel mounted on a No. 303 mandrel, and having one or both sides covered with a disk of thin metal,—like the bright metal shield,—will be found very convenient and effective. It will also prove useful in protecting





from injury the adjacent natural tooth when a root is being ground away to prepare it for a crown. The cuts illustrate both uses of the device.—JOSEPH K. EVANS, Chicago, Ill.

DRILLING PORECLAIN TEETH.—A cavity may be prepared for filling in a porcelain tooth by the following simple process: Grind out a smooth surface with a small corundum-wheel, to a depth corresponding to the coaptation of the spherical surface of the wheel. Invest the tooth in plaster so as to hold it firmly, and then sharpen a small engine bur to a point one-thirty-second of an inch across. Light blows with this, turning it at the same time after the manner of the sculptor, previously wetting the cavity with a mixture of the spirits of turpentine and camphor, and keeping it so, will enable you to drill a hole in each end of the oval cavity and connect them for filling with the greatest of ease.—F. E. BUCK, Jacksonville, Fla.



THE SMALLEST EDENTULOUS ADULT SUPERIOR MAXILLÆ.—Dr. E. G. Betty, of Cincinnati, some years since presented to the Ohio College of Dental Surgery as his graduating specimen of continuous-gum work a piece made as a practical case for an old lady. The illustration shows the exact dimensions of the piece, which is believed to be the smallest entire superior denture ever made for a human adult.

PULVERIZED PUMICE AND GLYCERIN, mixed and kneaded into a stiff dough, will be found useful for taking impressions of tooth-cusps or other surfaces which it is desirable to reproduce in metal to serve as dies. Molten metal of any kind can be at once poured into such molds. The dough may be agreeably perfumed with a few drops of lycopodium.—H. P. OSBORN, South Orange, N. J.

THE

DENTAL COSMOS.

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ORIGINAL COMMUNICATIONS.

ETIOLOGY OF IRREGULARITIES OF THE TEETH.

BY EUGENE S. TALBOT, M.D., D.D.S., CHICAGO, ILL.

(Read before the Section on Dental and Oral Surgery of the American Medical Association, at Cincinnati, Ohio, May 8, 1888.)

ARREST OF DEVELOPMENT OF THE SUPERIOR MAXILLA.

THE subject of the etiology of irregularities of the teeth is so comprehensive and so replete with points of interest, that it is obviously impossible for one to enter into minutiæ within the limits of a single paper. I have therefore deemed it best to prepare a series of papers, in which an attempt will be made to present in an intelligible manner the conclusions formed during an extensive experience in the examination and study of the mouths of strong and well-constituted persons, of the mouths of the insane, idiotic, deaf and dumb, and blind, and of models of various deformities of the jaws and teeth. In the present paper—the first of the series—attention will be given to such irregularities as are developed coincidently with the growth of the skeleton; these being, as is well known, chiefly connected with the superior maxilla.

Irregularities of the teeth may be classed as, first, those developed with the formation of the osseous system, and due to constitutional causes; second, those produced by local causes. Irregularities which are inherited, or appear (*pari passu*) with the development of the osseous system, always take definite shapes, and are the result either of arrested development or of inharmonious growth of the maxillary bones. Where arrested development causes deformities they assume the forms known as the saddle and V-shaped arches, or deformities of a similar character. Where the deformities are due to local influences they may assume any shape or position, the irregularities appearing at or soon after the development of the permanent teeth.

English and American authors have spoken of irregularities as congenital, or being of a congenital origin. We can readily understand that the deformity of a single tooth may be congenital, but cannot agree in the classification of an irregularity of several teeth upon either or both jaws among congenital deformities. Congenital, according to Webster and Quain (whose definitions are generally accepted by medical men), signifies "pertaining to or existing at birth." For instance, cleft palate, hare-lip, and spina bifida are congenital deformities, because they exist as entities at birth. The first teeth have not taken positions at birth, and as the permanent teeth do not appear for six years, nor assume any degree of deformity for some years after eruption, general irregularities of the permanent teeth hardly come under Quain's definition of congenital.

In discussing the subject of irregularities of the teeth it is necessary to commence at the formation of the bones of the skeleton, taking up the different deformities in their natural order, and finishing with the simple irregularities caused by local disturbances. As already indicated, attention will be directed in the present paper chiefly to the subject of those constitutional and hereditary conditions which affect the form of the maxillary bones. The maxillary bones include that part of the upper and lower jaw to which are attached the muscles, and not the alveolar processes, which are for the purpose of retaining the crowns of the teeth while they are forming, and for the retention and support of the teeth after eruption. Anatomists speak of the two portions as one bone, but the growth and functions of the two parts differ so widely that it seems necessary to the orthodontologist to consider them as separate and distinct structures. The lateral halves of the human frame do not always correspond in weight and size. This is true of both external and internal organs. This difference in the contour of both sides of the cranium may be seen in almost every head-measure taken by the hatter. The feet, hands, and limbs will show the same variation in the lateral halves. We should, therefore, be prepared to find not only differences in the upper and lower jaws, but changes in the lateral halves of each bone. This can be shown by taking full and accurate impressions of both jaws and mounting them upon wire articulators. By comparing first the complete jaws and then the lateral halves, we may readily see the extent of the variation. These deformities are often so prominent that mechanical interference is necessary to improve the appearance and the use of the teeth.

We are indebted to Mr. Langdon Down for first calling the attention of the profession to the V-shaped, saddle-shaped, and high arches in connection with the condition of idiocy. Later on, Dr. W. W. Ireland contributed largely towards our knowledge of and interest

in these deformities. Both of the gentlemen named are at the head of large English institutions for the feeble-minded, and are devoting their lives to the care and training of these unfortunates. The numerous able papers pertaining to this subject which they have published bear testimony to their experience and ability in all phases of idiocy. The most remarkable feature of their conclusions, as far as I am able to comprehend them, is their apparent recognition of the frequent existence of the three principal forms of maxillary deformity, and their failure to recognize any other forms of osseous asymmetry and irregularity in the skeletons of idiots. Such a preponderance of maxillary deformities, as compared with other osseous tissues in the same class of subjects, is incomprehensible to me, and I find upon investigation that several prominent writers entertain quite different views. Drs. Kingsley, Stellwagen, and White claim that the saddle and V-shaped jaws and high arches are by no means characteristic deformities of idiots, and that they occur with no greater frequency than in other classes of patients. These authors also fail to note any especial tendency to irregularity and asymmetry of development in the general osseous tissues of idiots.

In extensive personal examinations through various institutions for idiots, deaf and dumb, and blind, the conditions which have been observed may be classified as, first, those which are developed with the growth of the individual, which may be properly called constitutional; and, second, those produced by local influences. I found not only the three principal deformities of the jaws but other irregularities to be quite common. Among them were: Cases of large jaws, protrusion of the upper and lower jaws, high arch, V and partially V-shaped arches, saddle-shaped arches, small teeth, and arrested development of the jaw-bones, especially the superior maxilla. While making these examinations I observed, in many of the individuals examined, deformities and arrest of development with asymmetry of different members of the body. From these examinations I believe myself warranted in the assertion that a much larger percentage of deformities of the teeth and jaws exists among a given number of imbeciles, deaf and dumb, and blind than in the same number of normal individuals, the various conditions being the result either of arrested development, inharmonious development, or excessive growth. When we consider what special conditions constitute the entity termed "idiocy," such occurrences are not at all surprising, idiocy being a general condition. Dr. Shuttleworth has aptly described idiocy as "a vice of the entire organism; an affection not only of the nervous system, but of the functions generally of organic life. Oftentimes the whole bodily conformation bears the impress of idiocy, and not only the lineaments of the face, which

by its intelligence should reflect the Divine image, but also the form of the limbs, and especially of that masterpiece of mechanism, the human hand, are sadly marred." By studying the causes and effects of idiocy we may be able to find the relations between it and abnormalities of the maxillary bone. According to one of the best authorities (Dr. W. W. Ireland) "idiocy is mental deficiency or extreme stupidity, depending upon malnutrition, or disease of the nerve-centers, occurring either before birth, or before the evolution of the mental faculties in childhood." From this definition we see that arrested or imperfect development of nerve-tissue may take place either in utero or soon after birth, before the organs and tissues are developed perfectly. Such perversions of development do not confine themselves to nerve-tissue alone, but may occur in any or all the tissues of the body, having apparently an especial predilection for the osseous system.

It is obvious that any condition of malnutrition, particularly if existing during the period of embryonal and infantile growth and development, which is sufficiently marked to cause perversion of growth in the complex nervous centers, must necessarily affect the tissues in general. Nerve-tissues have relatively greater vitality than the other tissues of the body, and every physician knows that the brain and spinal cord will often functionate after the other structures of the body have been seriously impaired by disease. Nowhere in the range of medicine is the old adage of *mens sana in corpore sano* more aptly illustrated than in the general make-up of the idiot. He is an imperfect creation, and, as far as my observations go, often thrown together in a manner quite suggestive of the absence of design.

Consanguinity in Its Relation to Deformities in General.

Consanguineous marriages not infrequently result in mental aberrations in the progeny. Dr. Howe states that in seventeen families, the heads of which were related by blood and intermarriage, the result was fearful. Most of the parents were intemperate or scrofulous, and some combined both evils, so that it must be admitted there were other causes besides consanguinity to increase the probability of infirm offspring. There were born in these families ninety-five children, of whom forty-four were idiots, twelve others were scrofulous and puny, one was deaf, and one was a dwarf. In some of the families all the children were either idiotic or very scrofulous and puny. In one family of eight children five were idiotic. The commissioners of idiocy in Connecticut found in one hundred and sixty cases of idiocy, twenty which apparently resulted from consanguineous marriages. Of these twelve were children of

first cousins, three of second cousins, one of third, and four of distant relations. Dr. Langdon Down found that out of seven hundred and fifty-three male idiots thirty-three were the offspring of first cousins, three cases of second cousins, and four of third cousins,—in all forty cases out of seven hundred and fifty-three, or rather more than five per cent. Of the two hundred and ninety-five females, thirteen were the children of first cousins, three of second cousins, and four of third cousins,—in all twenty among two hundred and ninety-five, or little less than seven per cent. His researches show that in England at least every fourteenth idiot is the child of cousins. The majority of cases of idiocy appear at birth, and many such may be traced to habits or tendencies of ancestors. Often it is difficult to determine in what generation the germs of the disease were planted. Ludwig Dahl, of Norway, in his work on "Insanity," shows by means of a genealogical tree how an apparently healthy couple may have children, grandchildren, and great-grandchildren affected with idiocy and insanity. In reviewing the field of possible causes of idiocy, I am greatly impressed by the apparent influence of consanguineous marriages. Dr. S. M. Bemis, of Louisville, Ky., has found through his examination of statistics supplied by a number of physicians, that among two thousand seven hundred and seventy-eight children, the fruits of intermarriage of first cousins, seven hundred and ninety-three were normal; one hundred and seventeen deaf and dumb; sixty-three blind; two hundred and thirty-one idiotic; twenty-four insane; forty-four epileptic; one hundred and eighty-nine scrofulous; fifty-three deformed; six hundred and thirty-seven died early.

Scrofula.

The most common lesion accompanying idiocy is some form of scrofula such as strumous ulcers, skin eruptions, abscesses, enlarged and suppurating glands, diseases of the eye and ear,—these diseases being quite general attendants of idiocy. A very large proportion of all persons affected with idiocy die of consumption of the lungs, which is of all diseases most often associated with what may be termed a defective make-up. Dr. Ireland says that at least two-thirds of the idiot class are of scrofulous constitutions. Is arrested development of brain-tissue the result of scrofula, or do scrofula and idiocy proceed from a common cause? is a question which is often propounded to physicians. In the light of recent observations, I am personally of the opinion that when the two conditions are associated they are dependent upon a common cause; never in my opinion do they bear the relation to each other of cause and effect. The teeth, as we well know, are affected in their development and

growth by scrofula and other constitutional defects. The other organs and tissues of the body may not outwardly show such defects as plainly as do the teeth, but the result of any constitutional disease will nevertheless be apt to exist in a form quite as markedly pathological.

Drunkenness in Parents.

There is a wide variance of opinion among medical men regarding the probable influence of intemperance of parents in the production of idiocy and allied conditions in their offspring. Dr. Langdon Down is emphatic in his opinion that drunkenness at the time of conception is liable to produce serious results upon the brain of the child. Ludwig Dahl believes that the abuse of brandy in both father and mother is one cause of the large number of idiots in Norway. On the other hand, Dr. C. T. Wilber, of the Illinois State Asylum for Idiots, states that in three hundred and sixty-five idiotic patients eight only claim drunken parents. Dr. Graham, superintendent at Earlswood, England, also states that he found among eight hundred inmates of that institution but six cases of idiocy which could be attributed to intemperance of parents. Whether or not drunkenness is responsible for idiocy we cannot decide, but we know positively that intemperate habits are transmitted from generation to generation, each series of progeny in the line of descent showing a lower grade of intellect. As further illustration I cannot do better than quote Dr. Shuttleworth:

"Considering the intimate and prolonged dependence of the child upon the mother during gestation and nursing, one would suppose *a priori* that maternal rather than paternal drunkenness would count most in the production of idiocy. In the cases which I have tabulated, drunken fathers preponderate in a majority of thirteen to four. Possibly the mental anxiety entailed upon the wife by a drunken husband during the impressionable period of pregnancy may in part explain the discrepancy. Whatever the direct effect of drink upon the fetus in utero, there is little doubt that such nursing as a child is likely to obtain from a drunken mother will intensify any predisposition to mental defect. The baneful practice of giving infants alcoholic drinks seems to prevail to a great extent in Sweden and Norway. Such practice may in part account for the extensive prevalence of idiocy and juvenile insanity in Scandinavia as described by Ludwig Dahl."

Pre Natal Influence and Intra-Uterine Education.

It is unquestionably a fact that a fright to the mother during pregnancy is occasionally a cause of idiocy in children. Women instinctively shrink from anything which would produce a shock or

special mental impression during the period of gestation, fearing for both the mental and physical welfare of the child. Strange to say, the same maternal instinct prevails with the brute creation.

Dr. G. H. Fisher has written a very complete history of the "Literature, Classification, and Description of Human and Brute Monstrosities," including the so-called parasitic monster known as "Fetus in Fetu," and the various supernumerary formations of parts and organs which are familiar to medical men. Many interesting cases are given by this author, including deformities of the upper and lower extremities and internal organs. He states positively that the lower animals may become insane, and that heredity and pre-natal shocks have much to do in producing these conditions.

Innumerable cases of pre-natal shocks producing idiocy, where the parents were both apparently healthy, are on record. In one case the news of the loss of the husband at sea had the effect of impairing the intellect of the unborn child. Again, the same result occurred in another case as a result of fright occasioned by a team of horses running away with the mother when well along in utero-gestation. Baron Percy, a French military surgeon, observed that out of ninety-two children whose mothers had been exposed to the terrors of a tremendous cannonade at the siege of Landau, in 1793, sixteen died at the instant of birth; thirty-three languished from eight to ten months, and then died before the age of five years; and two were born with numerous fractures of the bones of the limbs.*

The authorities for the above are "Medicine in its Relation to the Mind," Dickson; Griesinger on "Mental Diseases;" "Insanity," by George H. Savage; Ireland's work upon "Idiocy and Imbecility," and the Transactions of the Association of Medical Officers of American Institutions for Idiots and Feeble-Minded Persons.

The result of the various lesions and pre-natal impressions already mentioned is not only mental in character, but we invariably find arrest of development of brain-substance in idiots, imbeciles, and feeble-minded children, the different terms indicating the degree of mental development. It is to be observed that a majority of these cases are affected by impressions made upon the fetus in utero through the influence of the parents. A few cases, however, are mentioned as resulting from diseases or injuries occurring soon after birth or in childhood. If arrest of development of brain-tissue occurs in utero or in early childhood, other organs or tissues of the body are likely to be similarly affected. The brain of the idiot is lighter and has fewer convolutions than the normal brain, and also differs in that the convolutions of the idiot's brain correspond on

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* Trans. N. Y. State Med. Soc., 1865–68.

both sides, like the monkey's, while they vary in the normal human brain. The anterior lobes of the cerebral hemispheres are imperfectly developed, and where the head is unusually small the antero-posterior diameter of the cerebral hemispheres is shortened. Irregularity of the two halves of the brain is quite commonly observed.

The cerebellum, pons Varolii, and medulla oblongata are smaller than normal with almost perfect asymmetry. Not infrequently portions of the brain are altogether absent; absence of the entire cerebellum and a rudimentary condition of one or both olivary bodies, peduncles, optic thalami, and corpora striata having been noticed. Griesinger, in his work on "Mental Diseases," mentions a number of interesting cases, one of which we will cite. The brain examined was that of a girl seventeen years of age, who presented the highest type of idiocy, in conjunction with a generally defective physique. The conditions present were very interesting, and may be briefly described as follows: The middle free portion of the corpus callosum was entirely absent, as were also apparently the septum and the middle portion of the fornix. The anterior and white commissures of the gyrus fornicatus were decidedly rudimentary. The convolutions presented an abnormal grouping, and the island of Reil was greatly atrophied. Some of the convolutions were entirely absent. The lobes of the cerebellum were asymmetrical.

Dr. A. Wilmarth, of the Pennsylvania Institution for Feeble-Minded Children, says, "In six brains, the island of Reil was exposed through the defective development of the third frontal convolution; in four cases on two sides, in two on one side only. In eighteen brains six were found where the cerebrum failed to cover the cerebellum by from one-eighth to five-eighths of an inch."

I could quote indefinitely from eminent authorities at home and abroad to show that not only are the different structures of the brain of the average idiot atrophied and often entirely wanting, but that diminution of weight is the rule. Enough cases have been cited to give a general idea of the defects in anatomical structure.

Having determined the constant relation of defective cerebral development to idiocy, it remains to be proven whether the defective condition is a special one affecting the brain only, or is an integral part of the generally defective or mal-development, or at least of a general tendency toward such perversions of growth. When we take into consideration the fact that the fetus is developed in two lateral halves, which may or may not develop harmoniously, and may or may not fuse together properly, it becomes logical to presume that any influence which tends to produce inharmony and asymmetry of growth in one part of the body—*e.g.*, the brain—must necessarily tend to produce the same conditions in other portions of

the fetal halves, providing such influence is not a purely local one. The causes of idiocy not being local, but general, the inference is obvious. It is astonishing to me that the superintendents of institutions for feeble-minded have made so little note of the asymmetrical relations of the two lateral halves of the body, in the cases under their care. Personally, I am of the opinion that harmony of members does not generally prevail in the anatomy of the idiot. In examining the inmates of various institutions, I was struck with the numerous examples of arrested development, hypertrophy, and asymmetry of upper and lower extremities. These abnormal conditions accord with the types of cerebral mal-development already cited. The following cases from other sources confirm the accuracy of these observations.

Report of Cases of Arrested Development and Excessive Growth of all the Tissues, in Connection with Idiocy, Imbecile and Feeble-Minded Children.

(1) Rawdon, H. G.* "Case of dwarfed growth, with idiocy and congenital tonic contractions of the muscles of the spine and limbs.

"Boy of five and a half years; admitted into the Liverpool Infirmary for Children, October 15, 1878. Weight, ten and a half pounds; height, twenty-nine inches; intelligence very limited; can utter no articulate sound. Eyes large and well developed, yet he is undoubtedly blind. Sense of hearing apparently normal. He has all his first teeth, but makes no attempt to masticate his food. Forehead does not recede, head is proportionate to size of body; circumference over the occipital protuberance and eyebrows, sixteen inches. Cannot sit up, the back below the neck being rigid and arched in the lumbar region from tonic contraction of the spinal muscles, producing a condition resembling opisthotonos. The upper extremities are in a state of rigidity. . . The limbs have a wasted and shriveled appearance, but the face is not thin. The child has evidently been well cared for. There is no tendency to rickets. Facial and cervical muscles are unaffected. . . The child was affected as described from his birth; was a twin, but only one-third the size of his fellow-twin; he cut his teeth at the usual period; has had no convulsion or disease of any kind since his birth. He was suckled; father and mother are healthy and live in the country, and their children before and after the birth of this one were healthy and well developed.

"I have thought this case might be of interest to the profession. It certainly seems a curious fact that I should not have been able to discover any report or notice of a case at all similar to this one; and

* British Medical Journal, London, 1879, 1, 386.

yet I cannot doubt that such cases have from time to time occurred. The case may perhaps be regarded as one of intra-uterine blight, but why or when it took place we can have no means of judging."

(2) Mazier, Edmond.* "On arrest of development in idiocy."

General conclusions of author: "1. Idiocy consists in an arrest of development primarily of the nerve-centers. 2. This arrest of development may appear at any time of life, uterine or extra-uterine. 3. The organs whose development is incomplete at the time when the arrest of cerebral development occurs are also affected in their development. 4. The anomalies thus resulting consist in the persistence of one of the transitory or rudimental forms through which the body must pass before reaching its complete development. 5. The arrest of development of an organ interferes with its functions, and from this result malformations and numerous organic deviations which constitute a secondary series of anomalies only mediately allied to idiocy.

"Case I. E. P., æt. sixteen years; natural child, twin; had ocular hemorrhage soon after birth; convulsions till the age of seven; percutient cephalalgia; began to walk when two years old; could speak a little earlier. Cranium: Antero-posterior diameter, 0.18m.; transverse diameter, 0.15m. Face: Total length, 0.155m.; occipitomental diam., 0.278m. Mouth open. Tongue always protruded between the teeth; palatine arch is deep and oval. Genital organs are rudimentary. Voracious; glutton. Is susceptible of education, having learned to read, cannot write or count. Tries to be useful.

"Case II. P. S., æt. eighteen; idiot. Mother hysterical; grandfather died of apoplexy; grandmother was a drunkard, and died of phthisis. Forehead narrow, temples hollowed. Microcephalic. Began to speak and walk very late. Is very clumsy; has had convulsions; is frequently angered. Epileptic vertigo; chronic ophthalmia. Eyes quite separated. Dentition defective; superior dental arch is triangular. Teeth are disposed in three rows, and are prominent and projecting. Ears small. Nose greatly developed and arched. Forehead receding and depressed. Cranium: Antero-post. diam., 0.170m.; transverse diam., 0.137m. Face, total length, 0.127m.; extl. orbital line, 0.107m. Defective formation of the feet and hands, which are flat; thumbs are thick, short and spatula-like. Penis well developed; pubis hairy; no testicles in scrotum, but can be felt in the inguinal canal on each side. Masturbator; does not understand anything; impulsive, violent, cynical.

"Case III. P. P., æt. seventeen. Idiot in the second degree.

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* Paris Thesis, No. 452. Paris, 1879.

Congenital club-foot. At age of three years had meningitis, with convulsions for fifteen days, and consequent permanent strabismus. Began to walk at four, and to speak very late and with great difficulty. Has had variola, typhoid fever, pleurisy, and scrofula. Head well formed; hearing good. Face: Only two incisors in upper maxilla; no canines; three molars on each side. Inferior maxilla is narrowed at a level with the premolars (permanent); two canines; gums fungous, spongy and bleeding. Hands large and purple. Atrophy of testicles. Penis normal.

"Case IV. G. D., æt. twenty-one years. Microcephalic; can speak and read. Cranium rudimentary. Ant.-post. diam., 0.147m.; transverse diam., 0.118m. Face: Total length, 0.122m.; occipito-mental, 0.202m.; external orbital line, 0.097m.; opening of superior dental arch on a level with the first premolar, 0.027m. Ears well developed. The superior dental arch is contracted at a level with the molars, and thence divergent; teeth carious. Finger-nails curved like claws. Thumb of right hand is upon the same plane as the other fingers, and its dorsal face is turned backwards. Feet long, flat, narrow, and misshapen. Intellectual faculties *nil*. Tries to attract attention.

"Case V. L. L., æt. thirteen. Imbecile. Scrofulous constitution. Double convergent strabismus very marked. Ears largely developed. Palatine arch high, regularly oval and deep. Superior maxilla large and thick, and its teeth carious. No canines. Tonsils large, with atrophy of uvula. Genital organs atrophied; single testicle in scrotum. Belly large and pendulous. Is able to read and write. Is easily angered.

"Case VI. G. S., æt. sixteen. Imbecile; deaf; internal strabismus. Head normal. Face long, 0.152m.; width, 0.075m.; occipito-mental diam., 0.233m.; dental arch at a level with the first molar, 0.022m. Ears long. Mouth always open. Superior dental arch narrowed; palatine arch oval and deep; tonsils enormous; teeth carious and irregularly disposed. Superior prognathism. Lips thick; the inferior is hanging. Intellect susceptible of development.

"Case VII. L. O., æt. sixteen. Complete idiot; deaf and dumb. Head quite large. Eyes nearly always closed; strabismus. Convulsions four days after birth, daily attacks till the age of eighteen months. Left hemiplegia and right hemichorea. Could walk at two and a half years. Has a deaf sister who has a hare-lip. Ptyalism. Face asymmetric, more developed on right side. Cranium: Ant.-post. diam., 0.165m.; transverse, 0.135m. Intellectual faculties *nil*.

"Case VIII. F. N., æt. fifteen. Scrofulous constitution. Microcephalic. Cranium: Ant.-post. diam., 0.145m.; transverse diam., 0.127m. Face: Length, 0.126m.; occipito-mental diam., 0.222m.:

external orbital line, 0.101m.; dental arch on a level with first premolar. Chronic blepharitis. Can speak, hear, and reads a little, but cannot write nor count. Incapable of the least mental effort.

"Case IX. A. B., æt. ten. Superior and inferior prognathism; still has his first teeth, which are quite regular. Intellectual faculties *nil*."

N. B.—The measurements are in the metric system.

There are seven other cases almost precisely similar to the above, given in the same work, but it is unnecessary to quote them.

In a paper by Dr. G. E. Shuttleworth, England, presented before the International Health Exhibition, London, August 2, 1884, upon "The Health and Physical Development of Idiots as Compared with Mentally Sound Children of the Same Age," he says, "Many idiots are undoubtedly small at birth; not a few have been brought into the world prematurely, but in nearly all imperfections of functions interfere with due nutrition and development, as the following table will demonstrate:

TABLE *showing the* RELATIVE MEAN STATURE *and* WEIGHT *of the General Population, and of Twelve Hundred and Nine Idiots and Imbeciles in Earlswood, Royal Albert, and Larbert Asylums.*

Age last Birthday.	Height.				Weight.			
	General Population.		Idiots and Imbeciles.		General Population.		Idiots and Imbeciles.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
	Inches.	Inches.	Inches.	Inches.	Pounds	Pounds.	Pounds.	Pounds.
5	41.0	40.55	40.0	39.5	......	39.2	39 0	37.5
6	43 0	42.88	42.25	41 25	......	41.7	43.0	41.0
7	45.0	44.45	44 0	43.25	......	47.5	46.5	45.0
8	47.0	46.60	45.75	45.25	55.0	52.1	50 5	49.0
9	49.0	48.73	47.5	47.5	60.0	55.5	55.5	53.0
10	51.0	51.05	49.0	49.0	65.0	62.9	59.0	59.0
11	53.0	53.10	51.0	51.0	70.0	68.1	64.5	66.0
12	55.0	55.66	52.5	53.0	77.5	76.4	70.5	72.0
13	57.5	57.77	54.75	55.0	85.0	87.2	77.0	80.0
14	60.0	59.80	56.5	56.5	92.5	96.7	85.5	88.0
15	62.0	60.93	59.25	58.0	102.5	106.3	94.5	95.0
16	64.0	61.75	60.75	59.0	117.5	113.1	103.0	102 0
17	65.5	62.52	62.5	59.25	135.0	115.5	110.0	106.0
18	66.5	62.44	63 25	......	142 5	121.1	116 0	108.0
19	67.0	62.75	63.25	......	143.7	123.8	120.5	108 5
20	67.25	62.98	64.0	59.5	145.0	123.4	121.5	108.5
21	67.5	63.03	64.25	......	146.2	121.8	122.0	....
22	......	62 87	64.5	......	147.5	123.4	122.5	....
23	......	63.01	......	......	148.7	124.1	....	....
24	......	62.70	......	......	150.0	120.8	....	....
25–30	67.75	62.02	64.75	59.75	151.2	120.0	123.0	109.0
30–40	......	......	......	......	152.5	120.8	....	....
40–50	......	61.15	......	......	155.0	118.6	....	....
50–60	68 0	......	......	......	157.5	104.0	....	....

"It will be observed that idiots are shorter than the general population,—at five years, by one inch; at ten years, by two inches; at fifteen years, by three inches; at twenty years, by three inches. While, as regards weight, male idiots are lighter than the general population,—at eight years, by four and one-half pounds; at ten years, by six pounds; at fifteen years, by eight pounds; at twenty years, by twenty-three and one-half pounds; the disparity being greater in the male than in the female sex. It appears that the relative rate of growth of the two sexes of idiot children follows the same rule as that of normal children, and is subject to the same variations at the age of puberty, for two years preceding which the growth of girls is in excess of that of boys."

Abnormally-shaped Heads.

If the mental capacity could in all instances be measured by the size and form of the head, many among the idiotic would rank high. The shape and size of the skull are indicative of the mind only in a general way, the feeble-minded being about equally divided between abnormally large and small heads. The measurement of the ordinary well-balanced head ranges from twenty to twenty-six inches in circumference, and that of the idiotic head from twelve to thirty-six inches. Opinions vary in regard to the average size of the microcephalic idiots, some claiming that all heads of sixteen inches and under come under this class, and others that thirteen inches in circumference is the average microcephalic head; while on the other hand all heads which measure more than twenty-six inches in circumference would be considered either macrocephalic or hydrocephalic.

The extreme cases are comparatively few in the institutions. Out of six hundred inmates of the Pennsylvania Institution at Elwyn, which I examined with the assistance of the superintendent, Dr. I. N. Kerlin, and Dr. Wilmarth, I found but twenty-eight microcephalic, twenty-four macrocephalic, and three hydrocephalic cases. We shall find these extreme cases exceedingly interesting in the study of the etiology of irregularities of the teeth, and shall give special attention to their relations later. There is a certain size of the head below which an individual must be an idiot. Voisin says that "the proper exercise of the intellectual qualities is impossible with a head of from eleven to thirteen inches in circumference, and a measurement of eight to nine inches from the root of the nose to the posterior border of the occipital bone." Irregularities in the external surface of the cranium predominate in every idiotic head, and in such variety that no two heads are found alike. These conditions show a want of development of the brain. The brain-sub-

stance being the first to obtain its growth, the cranial bones are molded about it, and are in a manner supported by it until the sutures have united. If the brain be slow in developing and shaping, ossification of the sutures is retarded; should the brain or parts of it be retarded in growth, the cranium would be either microcephalic or asymmetrical in its development. Again, inharmonious closure of sutures may also produce unilateral contractions of the bones of the head. I do not wish to convey the idea, however, that asymmetry in the cranium is always the result of malformation of brain-tissue, as by far the majority of cases result from arrested development or interruption in the growth of bone-tissue. Per contra, I am well aware that perfectly symmetrical heads are rare in even normal individuals. The diagrams in possession of our hatters tell a woful tale, not at all flattering to our racial self-conceit! This retarded growth may result from constitutional disturbances acting unfavorably upon general nutrition, or from inflammatory conditions of the osteophytic membrane which may take place in utero, thus prematurely closing the sutures. There is no law governing the development of the brain and the closing of the cranial sutures. Those bones the sutures of which close before the proper time will be narrowed at the point of premature fusion. It is reasonable to expect that when bones prematurely ossify at one part of the cranium, dilatation will take place directly opposite, as the brain grows in the direction of the least resistance. This explains many peculiar deformities of the head. Again, if the majority of the sutures ossify prematurely, microcephalus may result. It appears reasonable also to infer that the shape of the basis cranii will be affected in a similar manner by too early or too late ossification. These changes are caused by improper nutrition of the bones and cartilage. A knowledge of this fact gives us a clear conception of the relation which various general conditions bear to idiocy and imperfect development in general. The influence of such perversions of nutrition as are produced by syphilis, tuberculosis, struma, and intemperance over the ossification and growth of bone is a most patent one. The shape of the base of the skull and the contour of the face depend largely upon the ossification of the sutures. When ossification of the cartilages occurs early, a shortening of the basis cranii results. Especially is this the case when premature ossification occurs in connection with the sphenoid bone. The age when the basilar portion ossifies in a normal subject is from fifteen to twenty years. Thus too early ossification naturally produces a shortening in the antero-posterior direction which causes serious deformities in the shape of the face, and an abnormal curvature at the base of the brain. The superior maxillary bones are attached to the

bones of the head and face by eight articulations, and as the ossification of the sutures occurs at about the same time as the ossification of the sutures of the basis cranii, the same influences which affect the cranium must also affect the superior maxilla. These conditions may account for family features not presenting themselves until middle age. This is a strong argument in favor of postponing the operation of regulating teeth until the contour of the face has been permanently established. When there is inflammation of the membrane in utero (which is of common occurrence), the sutures ossify before or soon after birth, and as a result the base of the cranium will assume and remain in an undeveloped condition, causing the face to present an abnormal shape and size, which will broaden the face, throw the cheek bones out prominently, make the nose broad and flat and sunken, and extend the space between the eyes, giving as a whole a face void of expression. When the sutures at the base of the skull ossify normally the antero-posterior diameter is longer, the base of the cranium is more angular, the features sharper, with the eyes closely set, and a face full of expression. The sphenoid bone does not attain its full size until from the twenty-fifth to the thirtieth year of age.

I am of the opinion that, when the bones at the basis cranii ossify before or shortly after birth, the superior maxilla and septum nasi assume a decidedly unnatural form.

Dr. Oakley Coles, in his work upon "Deformities of the Mouth," ascribes the different deformities of the jaw to premature ossification either of the sutures or the basis cranii. Thus he says that "the deformity known as inter-maxillary prognathism is the result of a force operating on the inter-maxillary bone, such force originating in the body of the sphenoid, and being transmitted by the intervening nasal septum." He says also, page 93, "After carefully examining the works of various writers on the subject of microcephalic idiocy, there seems sufficient evidence to justify the belief that premature ossification of the sutures is the rule in a majority of cases of microcephalus, and we may therefore assume, if we cannot absolutely conclude, that this influence operates powerfully in the production of the dental deformity known as the lambdoid jaw" (or V-shaped arch).

While, as has already been observed, I believe that premature ossification of the sutures and basis cranii is followed by deformities of the jaw and septum nasi, I do not think that they bear to each other the relation of cause and effect. In this I beg leave to differ with Dr. Coles. It is unnecessary to expatiate upon this subject in the present paper, as it will be the principal topic for discussion in another which I hope to present later on.

Résumé.

1. Irregularities of the teeth cannot be justly said to be of congenital origin, since they do not exist at birth.

2. Irregularities of the teeth cannot occur until they have erupted, and thus shown their relation to each other and to the jaw.

3. Irregularities of the teeth which I have denominated constitutional prevail to a greater extent among the idiotic, deaf and dumb, and blind than among an equal number of strong and healthy persons.

4. It may be seen that not only is the brain-matter deficient in the feeble-minded, but, as I have noted, many cases are seen which demonstrate that the osseous system is also generally defective.

5. Arrest of development is the result of malnutrition during embryonal and infantile growth, influenced by consanguineous marriages, scrofula, drunkenness in parents, pre-natal influences, intra-uterine education, and constitutional diseases, or of inflammation of the osteophytic membranes in utero.

6. Irregularities of the teeth do not exist among normal or large jaws, while among those who have abnormally small jaws, the majority have irregular teeth.

7. When premature ossification of the sutures at the basis cranii takes place, the antero-posterior diameter is shortened, producing arrested development of the superior maxilla.

8. When the bone-tissue is arrested in development from malnutrition, the maxillary bones are also affected.

9. When arrested development of the superior maxilla occurs the face often presents a sunken appearance at the angle and root of the nose, with the nose broadened and the inferior maxilla prominent.

10. In another paper I shall attempt to prove that the irregularities of the teeth called constitutional are the result of small maxillæ, and that Dr. Hammond's future man will not only lack hair and teeth, but the superior maxilla will gradually decrease in size and eventually become rudimentary.

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PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting on Tuesday evening, April 10, 1888, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street.

The president, Dr. J. Morgan Howe, in the chair.

The President. In place of the usual "Incidents," this evening, we are to have the pleasure of listening to a practical essay from Dr. S. G. Perry. As the paper details the results of Dr. Perry's personal endeavors, it will, I am sure, be very interesting and valuable.

Dr. Perry then read the following paper, entitled,—

Notes on Implantation.

Case 1. That of an elderly lady for whom a lateral was set in place of a root that was pushed into an abscess-cavity in the bone while attempting to set a crown on it. It was referred to at a recent meeting of this society. The peculiarity of this case is that the tooth was set in a diseased socket and yet did well from the first. I mention it again only because it has since been seen and is doing well.

Case 2. That of a young woman for whom a right upper bicuspid was put in place of a split root. Upon extraction the root was found to have two branches. The septum of bone between the two roots was burred away and a single-rooted bicuspid put in its place. To avoid the need of greatly deepening the socket, the end of the long root of this tooth was cut off and the end covered by a gold filling. The gold was carried out to the edge of the cementum in order to leave no surface for absorption to commence on. About four months after the operation the patient was seen, and the tooth was as firm and healthful as any in the mouth. Some time after my

operation, Dr. Younger made a new socket on the other side of the mouth for the same patient, and implanted a bicuspid to fill a space in which a tooth attached to a plate had been worn for seven or eight years. Six weeks after I saw the tooth, and it was firm and comfortable, though not yet quite as firm as the one I planted.

Some time since Dr. Lord saw this case, and yesterday I had the pleasure of showing it to our president. The patient stated that she fancied the tooth I put in was firmer than any in the mouth. This suggested the thought that there might be a condition of anchylosis about it.

Case 3. That of a middle-aged lady for whom my associate, Dr. Woodward, planted a superior central in a socket from which a defective root had been taken. The only peculiarity about this was that in about ten days or two weeks the tooth seemed loose, and in such a condition that one who was skeptical as to the possibilities of this operation would have said that it would be a failure. It then commenced to tighten, and is now as firm and healthful as any tooth in the mouth.

Case 4. This was the case of a young lady who for years had worn a Bonwill crown on the roots of the upper first molar. The crown was finally wrenched from its place and the roots split apart, causing pain and starting a latent abscess, which resulted in great swelling of the face. The roots were extracted, and, as I could not find a suitable molar, I determined to plant a bicuspid in the socket of the anterior buccal root. This socket was therefore kept open by wiping out with carbolic acid about every other day. After about a week had passed and the swelling had subsided, and the other two sockets had commenced to fill with new tissue, the socket I was keeping open was deepened a little with a bur in the engine, cocaïne being applied to lessen the pain.

This operation was repeated three or four times, two or three days intervening between each. I proceeded in this cautious way because I did not want to cause pain and swelling in a part so recently inflamed. The parts behaved well, and the tooth was planted and carefully articulated. There was no easy means of tying or supporting it, so it was left to be kept in place by its articulating opponent. It was not possible to get a very perfect fit between the tooth I had to use and such a socket as I could form, but it remained in place and, though rather loose, gave no trouble. The last time I saw it, which was about four or five days after it was set, there was seemingly no more inflammation about the part than if the three sockets had been allowed to heal in a natural way. I have since received an enthusiastic letter from the patient saying it was comfortable and useful.

I am not prepared to defend this "piecemeal" manner of making the socket. Perhaps it would have been as well to have used cocaïne of greater strength and have waited longer for its full effect, and then finished the socket at once. The manner in which I operated, however, met the wishes of my patient, and rather accorded with my own timidity.

Case 5 was that of an elderly man who came bringing his upper central in his hand, it having dropped out from the effects of tartar, long use, etc. Having no tooth that would answer, and knowing that no tooth I could find would be so natural in shape and color as his own, I cut off the crown and grafted a new root on to it, using a platinum and iridium wire and the oxyphosphate as in setting an old-fashioned pivot tooth. The new root was made a little longer than the old one. The socket was deepened until, by trial, the tooth was in position. It was then tied to its neighbors by a silk ligature. In three days the patient returned, reporting that the tooth was more comfortable than before it came out. In about two weeks he returned with the thread off, but the tooth was already so firm and comfortable that I did not renew it. I have since seen it, and it is doing good service, though not as firm as I could wish, as I did not get a very deep socket for it.

Case 6 was that of a lady for whom Dr. Woodward planted a central in a socket from which a worthless root had been extracted. The tooth was a good fit and was firm and comfortable from the first. The patient has since been seen, and the tooth is doing well.

Case 7 was that of a young woman for whom a right upper bicuspid was put in place of a split root which was extracted. The new tooth fitted very accurately and was not tied in any way. She used the tooth in mastication from the first. She came back in a few days saying that the articulation was not as perfect as when first inserted, though the tooth was not sore at all. A touch with the wheel perfected the articulation, and it has since been firm and comfortable.

Dr. Lord saw this case and can tell you of its appearance.

Case 8 was that of an elderly lady who came in with an upper right cuspid wrapped in a paper. The tooth had loosened and dropped out from gradual destruction of the pericementum. The root was comparatively free from tartar. She had previously lost a lower central in the same manner, and I desired to plant in its place the very tooth I afterwards used in Case 1. Her faith in this operation was not sufficient at that time, so the opportunity of using the socket was lost. She afterwards regretted that the trial was not made,—particularly when told how well the tooth was doing,—and when the cuspid came out she was quite ready for any operation.

I cut the crown off this cuspid and grafted on it a new root in the same manner as described in Case 5. The socket was deepened somewhat and a longer root used. As the first bicuspid was missing and the second one only a broken apology for a tooth, there was no easy means of tying the tooth in, and it needed support, for the socket was not and could not be very greatly deepened, owing to the waste of the alveolus. I therefore tied it to the neighboring lateral and central, weaving the ligature in and out, and to keep it off the gum and to make a sort of splint to steady the tooth, I mixed some oxyphosphate and patted it over the three teeth. It entangled itself in the silk and made a splint that gave good support to the tooth, and I expected a good result. But the tooth had not been in more than forty-eight hours when I saw that it was not likely to become attached. The gum was red and angry-looking, and there was a slight oozing of pus around the root. Considering that the root was not a suitable one, I decided to waste no time, so I took out the tooth and split off the root and added another one as before. I tied this in the same manner, but, before putting on the oxyphosphate, at Dr. Woodward's suggestion I put a flattened platinum and iridium wire over the tooth and then patted on the soft oxyphosphate. This kept it from breaking up in sections as occurred before. After ten days the gum on one side seemed to have become attached, but on the other side of the root there was the same angry redness and the same oozing of pus when the gum over the tooth was pressed upon. The gum was puffed out on this side, and in a condition that suggested "proud flesh." I determined to take this root out and make another trial. Some slight effort was required to take the tooth out, and on examination of the root it was found that the side that had become attached was stained by slender red lines that seemed like blood-paths and suggested the capillary loops that invade the granulations in the formation of new tissue. The other side of the root was smooth and shiny. I selected another root, using great care, with the aid of the magnifying glass, to find one that had not been stripped of its membrane. The tooth was put back and fastened as before, and in forty-eight hours there was so favorable a condition that I felt certain this time there would be an attachment. The angry condition of the gum disappeared, and in about three weeks the splint was removed and the tooth found to be quite firmly attached. It was, and still is, quite loose, however, owing to the fact that a deep socket was not made.

Case 9. That of a gentleman who came with a lower lateral in his hand. The tooth was immediately cut in two and a longer root grafted on to the crown in the manner before described. The tooth was then planted and tied with silk ligatures and the patient dis-

missed, all seeming well. The gentleman came back the next day saying that in sneezing he had struck his teeth together and split this crown off the pivot. That left nothing for me to do but to find another tooth, which I fortunately did, and planted it, tying it fast with ligatures in the usual way, and putting over the ligatures some oxyphosphate. I saw the patient some time after, found the tooth doing well, and removed the ligatures. Since then I have heard nothing of it. That break was an interesting matter to me. The tooth had been out of the mouth some time and had, of course, become dried and bleached. Those who have attempted to fill teeth that have been out of the mouth any length of time know that it is necessary to use great care or they will split them, as I did in another case where the socket was kept open for a month at least (being wiped out every few days with carbolic acid), in the hope of finding a bicuspid that would be suitable. I did find one, but in attempting to fill an approximate cavity I split the whole enamel off, leaving the bare and bald dentine, that looked like the head of a man who had lost his hair. That tooth was laid aside and, being unable to find another bicuspid suitable for that place, the gum was allowed to heal.

Case 10. An upper right cuspid having a very frail root, the inside of which was badly decayed, so there was nothing to do but to extract it. I burred it out with the engine to avoid crushing the socket, and hooked it out little by little; then planted an eye-tooth in its place, and it did well.

Case 11. A gentleman came with a lower central very loose and ready to drop out. I removed it, grafted a root on the crown, planted it in the socket and wired it in with platinum wire. It is entirely comfortable since that time, and answers every purpose; but the gentleman is a tobacco-chewer, and I have not much faith in the operation.

Case 12. A gentleman came with an abscessed root of an upper bicuspid, face much swollen, a black line coming under the eye and the eye closed. I advised him to have the tooth out, as I did not see any hope of saving it. I didn't like the angry looks of the black line under the eye. I told him to have the tooth out, but to save it and bring it to me. He did so, and I found it to be a double-root bicuspid with small abscesses on the roots. After cutting off the diseased parts, the roots were filled over the end with gold, and in about ten days the tooth was replaced. By this time the swelling had subsided and the face was comfortable. The tooth was loose for a while, but has since become firm, and is now used with the rest of the teeth with little if any thought on the part of the patient. It is not quite as firm as the others, but still it is a good tooth.

Case 13. A lower lateral, for which I thought I would find a suitable root, but could not find one, and finally put in a tooth which I had from the mouth of a younger person, the gentleman being quite contented with a little lack of naturalness about the tooth. It has become attached and is comfortable.

Case 14. This was the case of an elderly lady for whom an upper central had been attached to an apology of a root, and worn for about a year. The patient went to the West, and when she returned the tooth was loose and about ready to drop out, and the gum had receded from the front side of the root, leaving it bare. The tooth was extracted, pulled out with the fingers almost, and a new socket boldly made, cocaïne being used. Dr. Jno. B. Rich was in my office and saw the operation completed, and he will tell you that the patient said there was no pain caused by making the socket. The tooth was planted, tied with silk, and is to-day quite firm and entirely comfortable. The lady is delighted with it, although the gum does not come well down on to the tooth.

Case 15. I put in the other day a lateral about which there was nothing unusual except that there was an abscess upon the root when it was extracted, and the gum bled very freely upon the extraction of the root. A new lateral was planted in its place, which is growing firm and is comfortable.

I present these cases for what they may be worth, and not as an extravagant advocate of implantation. It is too early yet to feel sure that they will be durable.

Discussion.

The President. Dr. Lord, have you something to say on this subject?

Dr. Lord. Only that the cases which I saw presented a very favorable appearance, and certainly were successful up to that time.

Dr. Littig. Will Dr. Perry be kind enough to tell us how he prepares the pulp-cavity of these teeth before implanting: whether through the crown or from the end of the root?

Dr. Perry. I cannot tell you in detail as to all of these cases, but I have tried both plans. Sometimes I fill from the end of the root, as suggested by Dr. Younger, covering it over with gold; and I think that where that can be done it is a nice way to perform the operation: as when you have to cut off the root, which is sometimes necessary. I think the case which Dr. Howe saw was one in which quite a little piece of the end of the root was cut off, and the gold filling was carried to the cementum. In such cases there is an opportunity of taking out the pulp from the end of the root.

The President. I will state that Dr. Perry kindly allowed me to

see case No. 2, and both bicuspids were in a very pleasing condition. They were firm, and had a perfectly natural appearance, both the teeth and the gums, and a fine, smooth-pointed nerve-broach could not anywhere be inserted between the gum and the root. I tried faithfully, and found the gum attached to the necks of the teeth very firmly. I learned from the lady that they had been in about nine months when I saw them.

Dr. Bogue. Will Dr. Perry kindly tell us whether these implanted teeth had been out of the mouth one day or a year when used ; also whether he kept them dry or wet, and if he kept them wet in what did he keep them ; also whether there was any difference in the adhesion between those that had been kept dry and those that had been kept wet?

Dr. Perry. I don't think I can tell very much of the history of the teeth used, except that they were obtained mostly from Dr. Hasbrouck, and selected by him for my purpose. How long they had been out of the mouth I could not say. I found that several of my teeth split when I thought they ought not to have done so, and thinking it might be due to the dryness of my steam-heated house, I placed some bibulous paper moistened with water in the box in which the teeth are kept.

Dr. Bogue. You were keeping them dry then ?

Dr. Perry. I was unwittingly keeping them dry, and cracks have appeared on several of the teeth which I think did not exist before.

Dr. Bogue. Did you keep any of them moist afterwards in any other way than in a moist atmosphere,—in salt water, for instance ?

Dr. Perry. I did not, though I should think it might have been well to do so.

Dr. Bogue. Has Dr. Perry noticed any forming of periosteal or bone-tissue about the roots of these teeth ?

Dr. Perry. I have not made a careful enough examination to determine with certainty whether the firmness of the tooth was partly due to the formation of new bone or not.

The President. We will pass now to the consideration of the subject of the evening,—

Metals and Other Materials for Filling Teeth.

This is intended to include a discussion of the subjects of gutta-percha and amalgam, and especially the papers of Drs. Flagg and Bonwill, which there was not time to discuss at their reading. As Dr. Flagg's paper was the more recent and is fresher in our minds, we will consider that and the subject of gutta-percha first. I will ask Dr. Payne to favor us with what he has to say on the subject of gutta-percha.

Dr. E. T. Payne. The address delivered at our last meeting by Prof. Flagg would have been more profitable, it appears to me, if his remarks had been formulated for a paper which could have been read in forty minutes or one hour. Members could then have asked questions and brought out points which would have been instructive, and, I am inclined to think, more profitable than the protracted talk.

After eliminating the cavities where the speaker said gutta-percha was not indicated as a desirable filling for permanency, there can be no controversy as to its being the most permanent and useful filling for the class of cavities selected for its use. It confirms the judgment of men of experience—nothing more. Prof. Flagg distinctly said he did not want the material looked upon as a crutch to help us over difficult places, and spoke disparagingly of Dr. Atkinson, who had recommended it in that relation. His teaching in respect to this point will not be accepted by those practitioners who have kept sensitive, low-toned teeth quiet and comfortable with gutta-percha until something more permanent could be used. If young men do accept such teaching they will deny themselves a great help to usefulness.

I heartily indorse all that was said about using steam heat in preparing the filling for the cavity, and the heating of instruments also. Too much care cannot be taken in this matter. Heating any gutta-percha stopping over the flame of a lamp is bad practice, and generally results in more or less injury to the filling. Dr. Hill once told me he was convinced comparatively few dentists used gutta-percha in such a way as to obtain the best result. My experience induces me to indorse what he said so many years ago.

Regarding the longevity of gutta-percha fillings, I want to say that undoubtedly it is true that in a few instances fillings made of gutta-percha remained in teeth twenty years or more. Prof. Flagg left it a fair inference that the same result would obtain now if the case was favorable and a good quality of gutta-percha was properly used. The inference is *misleading* and *untrue.*

In a paper on gutta-percha read before this society four years ago, I stated that the gum obtained by cutting the tree and scraping the inside of the bark was much superior to any obtained by tapping. It is to that superior quality of gum—which Dr. Hill used the first years of his experience—that the results so much talked about are due. The specimens displayed by the speaker, both the crude and that which was prepared for the teeth, are the product of tapping. Fillings made in the best manner with such material will not last longer than from two to eight years. Very few indeed will last more than four. Let us not deceive ourselves. It cannot be depended upon as formerly. The reason is the inferiority of the base. A fountain does not rise above its source.

I object to the speaker's position in claiming so much for the material. It is very useful, and the cause is weakened by claiming too much. Young practitioners should be taught these facts instead of accepting the fair inference from Prof. Flagg's remarks that if his steam-made stopping is used all will go well for from five to thirty years. His statement that red gutta-percha shrinks more than any other may be proved by test-tubes, but my experience proves that it will last longer than the average stopping. One reason is it has less foreign substance incorporated into it. Pure gum would outlast any other, and if it could be used to advantage it would be almost perfect as to its lasting qualities. Its color, however, is objectionable.

I repeat what I said in my paper four years ago, that just in proportion as the particles are separated by a foreign substance, just in that proportion is the substance weakened both in strength and in ability to resist the fluids of the mouth.

We were told by Prof. Flagg that it is our duty to test the material before using it, as one can do so in a few minutes in his office. A little farther on we are told that so difficult is an analysis of the material that it is not known positively what substance Hill incorporated with his base. His statement that Hill's formula is unknown because he did not happen to know it is suggestive and amusing, to say the least. There was no intimation that gutta-percha stopping was not in every way as good now as it was twenty-five or thirty years ago when Hill and Bevans were using the gum before referred to. He knew, of course, that the best stopping in the market to-day is very much inferior to the article which gave the filling-material its deservedly high reputation. From such a source of learning and respectability we had a right to look for the whole picture. His assertion, for instance, that a good stopping cannot be made without steam heat, porcelain slabs, etc., is a dogmatic assumption which he refutes when he further says Hill's stopping lasted thirty years, etc. Hill never used steam heat.

From my experience with the preparation of the material I am confident steam heat is better than dry heat and kneading-sticks. But to say that good results cannot be obtained in the old way is not true. I experimented all one winter to make an improvement in the texture of the manufactured material, as there was such an evident falling off in quality, and I found the whole trouble was with the base. Until the material can be obtained as it used to be by cutting the tree, I propose to use the filling for what it is worth, as I find it, not expecting too much from it, or what was once realized.

The President. The next contribution to the subject of the evening will be a paper by Dr. Bogue, which he will kindly read now.

Dr. E. A. Bogue then read the following paper, entitled,—

Filling-Materials and Methods.

What do we fill teeth for? Evidently to keep out of a cavity already formed, substances that would enlarge it. It is futile therefore to pretend that anything that does not completely fill the cavity can completely stop the decay. The English call it a stopping.

Dr. Miller, of Berlin, has called attention to the remarkably preservative influence of copper amalgam, especially in cavities at the margin of the gums. His opinion has been for some time that the salts of copper, in some way as yet unexplained, have prevented or destroyed bacterial life, and so contributed to the preservation of the tooth from decay. While giving all thanks and praise to Dr. Miller for the careful and very laborious work that he has accomplished, I do not find myself able to reach the conclusions at which his researches seem to aim. I cannot regard bacterial life as in any sense a primary cause of decay. If all fermentative action is dependent on the presence of bacteria, we have only to keep a given territory free from substances that can ferment, and we shall have neither fermentation nor bacteria.

This I conceive to be the real explanation of the efficacy of copper amalgam: *it does not shrink.* Neither does palladium, and, so far as I can judge (and I have used them both since 1874), they are equally efficient in protecting teeth from decay. All the other amalgams, as far as I know, shrink more or less; therefore bacteria are found at their margins, in the fermentable mass deposited there.

Now, whether the egg comes first or the hen, I will leave for scientific men to discuss. Being a practical man, I will try to apply the discoveries of pure science, and seek to utilize them.

Our primary aim is to preserve the teeth. The secondary aim should be to preserve them in comfort, appearances taking a subordinate position. A filling as soft as tin can be placed where there is possible disintegration of the walls with less danger of marring the edges than a harder substance like gold. It is more easily placed and quicker. If no strength is required to resist the force of mastication, its only office would be that of a plug. That office it fulfills as well as gold. Being oxidizable on the surface, it is a question whether deficiencies in perfect adaptation, should any exist, are not measurably compensated for and provided against by that process. Furthermore, tin is a poor conductor of caloric; gold a good one. The comfort of the patient will be greatly enhanced, therefore, by using tin instead of gold in sensitive cavities. In some extreme cases, possibly life or death of the pulp would be decided by the material used. In many approximal cavities, especially if a matrix

be used, tin can be advantageously placed at the cervical margins and covered with gold to resist the force of mastication with positive benefit to the tooth. Although gold is malleable, it is impossible to make it spread easily, like putty, in a tooth. The blow which consolidates it must therefore be direct, and in a direct line with the wall against which it is to be consolidated. This is why the great majority of fillings that we see are soft all around their interior periphery.

It has been a tradition among many dentists (not founded on any mechanical law, but the contrary) that the interior of a cavity prepared for filling should be considerably larger than the orifice. The consequence is that the gold is not consolidated against the interior walls, but only against the walls of the orifice, and we know the state in which such fillings are found a few years later, if by chance even a microscopic defect is left anywhere in the mouth of the cavity. We know that in upper bicuspids the largest part of an approximal cavity is generally high up, near the smallest part of the tooth,—the neck. There is a general indisposition to cut away overhanging portions: hence the justice of the remark made by an experienced instructor, that "a man who could fill bicuspid teeth so as to save them, was already a good dentist." This results in the strenuous insistence, on the part of the best operators, that the walls of a cavity should be as nearly perpendicular as possible, leaving a sort of box rather than a jug to be filled, every portion of which is accessible to the direct stroke of the instrument.

The choice of a material should depend upon the character and condition of the teeth, the character of the person, and the condition of the pocket.

One would not venture a restoration contour gold filling in a largely broken-down molar in the mouth of a poor nurse girl of uncleanly habits, especially if she were acting as foster-mother; while one would not venture anything else for the real mother of the child, who, having lost her sixth-year molars and her wisdom-teeth, was compelled to depend upon her twelfth-year molars for mastication, with a little assistance from a French cook at fifty dollars a month.

One would not venture oxyphosphate fillings in large approximal cavities extending under the gum, of teeth that have been filed between, in the mouth of a healthful person, where there is a strong tendency to the deposition of tartar, because in such mouths the alkalinity would soon destroy the fillings. But oxyphosphate fillings would be indicated for grinding-surface cavities of an anemic girl, who makes her first visit to a dentist at the age of sixteen or eighteen, with pulps nearly exposed, and evidences of an acid diathesis strongly marked.

One would not venture large amalgam fillings in conspicuous cavities in the mouths of pet invalids of homeopathic physicians, unless he were sure that his standing is better in the family than that of the physician, or unless he were on particularly good terms with that physician. Otherwise, the next time her ladyship has a stomach-ache she is sent to Dr. X or Z to have those fillings taken out, because the physician "cannot treat cases of neuralgic dyspepsia complicated with the emanations from amalgam fillings." While for the busy day laborer, in a similar condition, one would not venture anything else.

Neither would one, under similar circumstances in these days, venture to use our old reliable stand-by, *tin*, unless his conscience were an important factor in the case, for, when the patient is sent to have those "amalgam fillings" out, Dr. X or Z will take them out all the same, and never hint to the confiding patient that they are *not* amalgam. But one *would* use tin for the moderately-decayed sixth-year molars and the partially-erupted twelfth-year molars of his own children and those of his best patients who thoroughly trust him; not being sure but those teeth are the ones to last for life, therefore not to be discolored, unduly imperiled, or trifled with in any way, even by gold operations at that tender age, nor by amalgam operations under frail overhanging walls on the grinding-surface, when the amalgam, being harder than the tooth, would cause breakage of those overhanging edges.

No more would one use an amalgam of the hardest kind in a large, V-shaped grinding-surface cavity, where the opposite tooth occludes; knowing that the occlusion against this hard wedge will eventually split the tooth.

I think we all owe our thanks to Dr. Flagg for his late discourse on gutta-percha, and especially for the clear way in which he has defined the class of cases where its use as a filling for decayed teeth is indicated. His enthusiasm leads him to say some things, however, that ought to be challenged. If he is right, it can be proven; if wrong, it is the function of this society to point it out.

As one person, I regret that Dr. Flagg felt it necessary to excuse himself for the exclusive use of plastics, or that he cited the fact of his presence before this society as an "evidence that he had maintained his respectability." He ought not to need any such evidence. It has been the maxim of this society to "prove all things, and hold fast that which is good." So all men having ideas to present have been welcomed.

It has been Dr. Flagg's effort for more than twenty years, of my personal knowledge, to save teeth that many other practitioners would extract. The good that he has accomplished commands sin-

cere respect; but I cannot say as much for some of his statements and some of his methods. I regret to hear such words as these: "I want to induce you to try these things, for certainly you must understand that you know little or nothing about plastic fillings. You may have been told that my practice is among the rag-tag and bob-tail from the gutters of Philadelphia, but you know very well that my patients are among the very best, the most intelligent, and the most wealthy of the people of that city, and are typical individuals of their class; and yet they are perfectly satisfied with the work I do for them."

Comforting the declining years of aged people, even if they are millionaires or members of the best society, by preserving their natural teeth, using the gentlest possible means, whether those means be gutta-percha or amalgam, is praiseworthy. But can we denominate as praiseworthy and strictly scientific a sentence like this: "If *I* do not know when it is best to extract a tooth, I do not know which of you does." Or a question so misleading as this: "If you place your gutta-percha, properly prepared, where little or no wear can come upon it, in such wise that you know just as well as you know anything that a zinc-phosphate filling would not have lasted two little years, a gold filling would not have lasted five years, an amalgam filling would not have lasted more than ten years, and your gutta-percha filling lasted fifteen years,—then I ask of you if gutta-percha properly used is not the most permanent filling-material we possess?" Dr. Flagg leads up to an answer which he seems to desire, but it should be recognized that his premises are not generally to be admitted without question, hence his inferences are often fallacious. Very few men, excepting Dr. Flagg, have seen many gutta-percha fillings fifteen years old, and Dr. Flagg himself is greatly elated by coming across such fillings. In such cases, undoubtedly it was the best material.

But when Dr. Flagg's next sentence asserts interrogatively that gutta-percha, properly used, is the most permanent filling we possess, I must think his enthusiasm would make his hearers infer more than he actually means; particularly when he continues by saying, "I want to leave with you to-night the impression that you can work gutta-percha precisely the same as you work cohesive gold." Yet farther on he admits the value of copper amalgam in desperate cases. Dr. Flagg counsels us to "have our gutta-percha tested so that we know exactly what it is composed of and the proportions of it," and he says "any man can test it in ten minutes in his office." Three minutes later Dr. Flagg says, "We have known positively for half a century that Hill's gutta-percha stopping was not made of quicklime and silex, but do not know what it was

made of. So difficult is its analysis that we have not been able to say positively what Dr. Hill made his stopping of." A little later in his address Dr. F. says, "The only way for you to use gutta-percha successfully is to test the various materials before putting them into the mouth. It is the work of a life-time."

"Ten minutes" have lengthened into "half a century," and half a century into a life-time very quickly,—but as Dr. Flagg says he tells "the truth, the whole truth, and nothing but the truth," we must seek to reconcile these conflicting statements as best we may.

Dr. Flagg says next, "I do not want *my* material to be looked upon as a crutch." He will, it is hoped, pardon the suggestion that this society was not aware that gutta-percha was a proprietary article, and it must regard all subjects brought before it as absolutely free for discussion. Dr. Payne asked how Dr. Flagg accounted for the protection of the tooth against decay when the shrinkage of a gutta-percha filling necessarily admits more or less moisture to the cavity, when disintegration of tooth would ensue if a gold filling leaked? (Please notice Dr. Payne's admission of the correctness of the general belief that a leaky gold filling will allow disintegration of tooth-substance around it.) Dr. Flagg replied that the gutta-percha was a non-conductor of galvanic or electric currents, and that *therefore* no chemical action takes place between the gutta-percha and the tooth-bone. He says the only action that can take place is the leakage of moisture.

Dr. Flagg, speaking of amalgams, says that "amalgam permits moisture to do good." He claims to recognize that fact, and therefore says that "amalgams that do not shrink are not as good tooth-savers as amalgams which shrink." He has much to say about tooth-savers, meaning fillings. His practice necessarily leads to inaccuracies both in excavation and in adaptation of filling-materials. He has invited the worst class of cases and the worst class of teeth. As it would be a physical impossibility to use gold in most of those cases, Dr. Flagg has elected to use plastics in all of them. The results obtained are the sum of his experience. This experience, though strictly empirical, is most valuable, but it does not justify anyone in dogmatic assertions that he cannot prove. All this galvano-electric current assertion comes under that head.

If Dr. Flagg could be induced to answer concisely, according to his knowledge, he would agree that the causes of decay in teeth, leaving out of view heredity, which would have to do with form and position, may be summed up in very few words, viz., that which causes solution. Now, solution of the enamel never takes place at any point where it is exposed to friction, but only in such spots or crevices as favor the retention of foreign substances which, under

the combined influences of heat, moisture, and atmospheric contact, speedily produce disintegrating acids in a nascent condition. The experienced dentist knows full well where to look for dental decay. The smaller the crevice the longer it takes for the enamel to break down, but Dr. McQuillen showed many years ago how, between two plates of sound enamel, the substances that produce decay may reach the dentine, and so largely disintegrate it as to cause almost total destruction of the crown before the patient is conscious of disease. How, then, can we be told that leakage is a benefit? How can those amalgams that contract be vaunted as the best? How can gutta-percha be regarded as anything else than a valuable adjunct to our various filling-materials?

We must necessarily challenge the statement that "amalgams that do not shrink are not as good tooth-savers as amalgams which shrink," for both palladium and copper are recognized as being the best preventives of decay among all the amalgams, yet these two do not shrink. Dr. Flagg himself counsels copper amalgam in desperate cases.

Dr. Flagg goes on to say, "In five minutes you can tell whether an amalgam will shrink or not." This is absolutely incorrect in regard to any strange or new amalgam. I have tested several amalgams that have continued to change their form for several days, sometimes shrinking, sometimes expanding.

I think Dr. Flagg scarcely meant that he could ascertain in thirty minutes the composition of a new amalgam; still less its quantitative composition. Yet one might infer that from his saying that he could ascertain its composition in thirty minutes.

In advocating gutta-percha for front teeth, Dr. Flagg failed to state that this material often becomes so dark on the surface as to be more unsightly than many amalgams, and always changes color, becoming fluffy or soiled.

Having thus called attention to a few of the inconsistencies and errors in Dr. Flagg's address, I beg to call attention to another portion of that same address which contains the most precise, accurate, and concise description of where and when to use gutta-percha that I have ever heard: "Gutta-percha is not presented as a material suitable for all sorts of cavities, but only those having circumscribed walls,—comparatively round, shot-hole cavities in the buccal, distal, and mesial surfaces of teeth, not on the articulating surfaces; where the cavity is small on the outside and large on the inside, and where the tooth is soft, of frail structure, and highly organic; such cavities as would be prepared for gold fillings by cutting away all the surrounding enamel-walls until you get to strong walls,—in filling such cavities with gutta-percha you conserve the enamel-

structure all that you possibly can." If you add frail and loose teeth and badly leaning ones to this category, it epitomizes the best features of the paper.

The President. Before we begin the discussion upon our subject and the papers which have been read, I will take the liberty of calling upon Dr. Benjamin Lord to make some remarks upon the subject of amalgam.

Dr. Benjamin Lord. Mr. President and Gentlemen: I do not propose to discuss to any considerable extent the great subject of amalgam, but to give briefly some of my own experience and observation on the use of the material in the treatment of dental caries.

It has been said that amalgam will preserve more teeth than gold; that if amalgam was more generally used filling operations would be more successful. The truth of this statement depends upon circumstances and conditions. That an amalgam made of any of the various alloys is a better material, in itself, for filling carious teeth than either gold or tin, I do not believe. According to my experience and observation, fillings made of any of the different alloys will change in some way, so that the margins become imperfect, and hence the cavity becomes but imperfectly sealed. It may be said with truth that *all* amalgam fillings do not become imperfect. Now and then we find them unchanged at the margins, but not often, and it is that liability to change which makes the material so unreliable and unsatisfactory. But, notwithstanding its unsatisfactory qualities, an amalgam of some kind can be used, in more or less inaccessible localities in the mouth, and in certain teeth, to greater advantage to the teeth than any other material, and it is in such cases that I believe we should use it.

It has been said that teeth that are soft in structure, and hence more predisposed to decay, should be filled with amalgam, but it is not my experience that it is as good for such teeth as tin foil. Of course, when teeth are badly broken down, they can be best treated with some of the plastics, and often amalgam is the best of them for such cases. It is my judgment that it is best to use tin foil, if any metal, for soft teeth, when it can be employed with a good degree of certainty of making a tight stopping.

Every one knows that any filling-material is at its best in teeth of dense structure. I have often observed that an amalgam of any of the alloys seemed to have a particularly unfavorable effect upon soft dentine, which would decompose, before very long, right around the fillings.

It would seem that fillings made of a plastic material should give

even results under the same conditions, but such is not the case. Some alloys are unfavorably affected by the quantity of mercury used, by the mode of combining the alloy and mercury, or by the character of the secretions of the mouth; something makes some amalgam fillings do much better than others, even in the same mouth.

When we come to use foil—gold or tin—we know what it will accomplish; if the packing, condensing, and finishing are accurate, there will be no changes in the margins of the fillings, so that foils have not the objectionable qualities of the alloy amalgams in this respect. It will be said—and with truth—that fillings of gold or tin do not always prevent further decay, but that cannot be due to the character or nature of the materials, but to a want of accuracy in the operation, or to unfavorable constitutional or systemic conditions that are beyond our reach.

If these views are correct, it would seem to follow, if amalgam will preserve more teeth than gold or tin, that either the foils are imperfectly inserted, or that the attempt is made to use foil in cases where it is not reasonable to expect that perfect operations can be made.

I have been using copper amalgam for five or six months, and from my experience with it so far, and from all that I learn from those who have used it a much longer time, I am led to believe that it is far superior to any of the various alloys in use. The surface of the filling becomes very dark, which is an objection only when it is exposed to view. I have not, however, noticed any staining or discoloring of the tooth-substance from its use. The material is of fine grain and even texture, and works the best of any plastic material I have ever used. The margins of the fillings do not seem to change, and it is said that there is no shrinkage, or any change whatever if the material is made right and properly prepared for use.

I believe that copper amalgam, in cases where the use of an amalgam is indicated by the existing conditions, will enable us to prevent further decay with far more certainty than with an amalgam made of any of the alloys. I may say that I have tried several different preparations of the copper, and find that they differ very much in quality: some would seem to be quite unfit for use, and ought to be discarded. The more recent preparations are very much better than those of years ago. From my correspondence with persons who are experimenting in the preparation of the article and who have succeeded in giving us the best in use, I should say that it was very difficult to prepare so that it may be in every respect quite right.

Some are using palladium, and I am told with very satisfactory results, liking it better even than copper in certain cases. I have not tried it. I have found amalgam to be invaluable for repairing gold fillings, particularly at the cervical walls, when it is found that decay has extended or that the gold is not solid.

The amalgam does not seem to shrink, or the margins to change, when it is placed in contact with gold, and the effect is very decided in preventing further decay. It would seem that this combination of the two metals must have an influence in this result, but in what way I do not understand.

In order to get the best results from this combination of metals I understand that it is necessary to place the amalgam by the side of the gold filling, and not to fill with gold against amalgam after it has become crystallized.

I consider the use of bibulous paper in the condensing of amalgam a very valuable suggestion. Indeed, I do not think there is any method by which it can be packed or condensed with so much certainty. The use of the paper under the instrument prevents any part of the mass from sliding, or spilling from the cavity when the force is used, and it also brings any excess of mercury to the surface, from whence it may easily be scraped away and the filling left quite hard and dry. It is my understanding that Dr. Bonwill was the first to suggest this method of condensing amalgam.

Dr. Perry. One good result of Dr. Flagg's lecture is the most excellent paper that we have just listened to from Dr. Bogue. I am in accord with almost every sentiment that he has uttered on that subject. Not that Dr. Flagg's paper did not contain much of great value. We know that gutta-percha for the approximal surfaces is often invaluable, but it has some drawbacks, one of which is its expansion, by which the teeth are wedged apart; and when you commence to wedge the teeth apart you break up their occlusion, disturb the teeth in the jaw, and set up a condition which is to be deplored. And just here I want to refer to Dr. Bonwill's statement that he used gutta-percha on approximal surfaces to wedge teeth apart for the purpose of easier filling with gold or amalgam, allowing it to remain half a year or more to gain space. I wish to state pretty plainly that I think that is one of the most deplorable expressions that can come from a man who claims to be a scientific dentist as late as the year 1888. That same result will often happen when it is not desired to wedge the teeth apart. On buccal surfaces gutta-percha has an opportunity to expand without disturbing the adjoining teeth; and it is not so objectionable, because it can be shaved away after a while.

Speaking of copper amalgams, I want to commend Dr. Lord's remarks on the subject of alloys. I think copper amalgam is one of the best materials that we have ever had for filling teeth, and the other amalgams are almost laid aside with me. I brought over from London, five or six years ago, a quantity of copper amalgam, but I did not venture to use much of it till within the last year, and since then I have used no other. In the use of copper amalgam it seems to me that a great deal depends upon the wetness or dryness of the material. We must learn what is the proper amount of mercury to leave in it. I had occasion, some time since, to remove a copper amalgam filling which I had placed in a few days before, and I found, to my surprise, that it had not been packed accurately against the walls of the tooth. It was in a granular condition, and had not enough mercury in it. Under a double magnifying glass it appeared full of little holes.

Dr. Lord. Has Dr. Perry used paper in packing amalgam?

Dr. Perry. I used for a great many years what Dr. Darby suggested long before Dr. Bonwill spoke of bibulous paper, that is spunk. In this case that I speak of the effect did not seem to be due so much to lack of pressure as to the dryness of the material; it did not have that soft and plastic quality which is necessary to make a good adaptation to the walls of the cavity. I am convinced now that a better result is obtained when a little more mercury is mixed with the copper amalgam. I want to ask Dr. Bogue if that is not so. He ought to be able to tell more about copper amalgam than any one else in this room, because he has used it longer and with more success. I would like to know his opinion, and his method of making and packing copper amalgam.

Dr. Lord. One word in regard to the use of paper. I think that if Dr. Perry had used paper over the surface of the filling and used a good deal of force, he would have readily ascertained whether there was mercury enough in the mass to soften it throughout or not. If there had been enough it would have been brought to the surface.

Dr. Perry. I have used paper a great many times. But I am convinced that I have been using copper amalgam too dry, so dry that I could not get the mercury out of it by that kind of pressure.

The President. Gentlemen, we have Dr. Niles, of Boston, with us to-night, and we would be glad to hear from him.

Dr. E. S. Niles. This is too great a subject for one to speak upon impromptu. We have considered the subject of amalgam in the American Academy of Dental Science for the last two meetings, and I must say that the result of the discussion is rather unsatisfactory. In fact, the present information on the subject discourages me in the

use of amalgam. I now speak exclusively of copper amalgam. Since I have been in practice I have been more or less dissatisfied with these fillings, as I think we all have, and have looked forward to some day when I might take up the subject for the purpose of making some satisfactory experiments. I regard the present investigation of amalgams as superficial, for the reason that when we speak of amalgams we may refer to any number of compounds all of which may vary in their composition. We know that the whole metallurgical field has been plowed over for metals that will amalgamate with mercury for stoppings. I am impressed with the fact that to investigate an amalgam, or to accumulate any data upon which to base calculations, the knowledge of its composition is necessary at the outset. If we say that so many parts of silver and tin, and so many parts of copper, zinc, etc., will produce a certain result, we then have known effects from known compounds.

If I take up an alloy to investigate in regard to its expanding, contracting, or amalgamating properties, I must know what I have in hand in order to make a record of value. We should know not only the metals that enter into a compound, but their proportions. You will readily see that different metals have a certain time or power of amalgamation with mercury. Now by compounding them we have no reason to suppose that that time or power of amalgamation will be changed. For instance, mercury will unite with tin very readily, and with silver and with copper under certain circumstances, with platinum very slowly, and with gold very readily. In mixing any of these metals together we have an alloy which will amalgamate in a short or a long time, as the case may be; it is usually mixed in the hand until the amalgamation is thought to be complete, and then introduced into the tooth; but very often the mixing is incomplete, and the amalgamation goes on after it is in the cavity, thereby changing the whole form of the filling. Does it not stand to reason that we should know that amalgamation has taken place throughout the entire compound before the filling is used? If the amalgamations are as perfect as we have them, for instance, with copper and mercury alone, have we not reason to suppose that some of the failures are due to this imperfect union of metals? I have said that I would use no compound in my practice of which I did not know not only the composition but the relative proportions of the component parts, and I am prepared to reaffirm that to-night. There is another point that I wish to make, and that is that if the metals of which amalgams are composed, especially mercury, be exposed to the air their surfaces become oxidized, and a great deal of oxide is intermingled with the fillings. Very few dentists, so far as I know, cleanse their amalgams from this oxide. Some have used alcohol,

but alcohol will not remove the oxides or other salts from zinc, tin, copper, mercury, or from any of the metals that are used. The only agents that will do it are acids or acid compounds. I am making some experiments in this direction which are proving very satisfactory. I was going to say in regard to the distinguished professor who addressed this society at its last meeting, that I am sorry he does not tell us fully and conclusively of what his compounds are composed, and in a way that would enable us to make similar preparations for ourselves. I am sorry to say that such is not the case, as my own experiments, as well as the experiments of my brethren in Boston and other cities, have proved. Some years ago, while attending school in Philadelphia, I boarded not far from Dr. Flagg's, and we used to have on the table what the mistress was pleased to call "*scrapple*." I was very much interested to know of what it was composed, and was told it was made of bits that came from the table, into which she put eggs, pepper, and various things. It might therefore be made of one thing one day, but of entirely different things the next. In reflecting upon this subject I have wondered whether the making of mysterious compounds in Philadelphia was confined to the manufacture of "*scrapple*" alone, or whether other combinations in that city may not have a similar origin.

As long as the profession consent to use alloys the composition of which they are not familiar with, no complaint can be entered against those who make amalgams or "scrapple" alloys.

Dr. Lord. Most of the copper amalgam that is prepared is not fit for use: it is too dirty, and requires too much washing and cleansing. But we can get a copper amalgam that seems to be perfectly clean and free from oxides; I do not think it would soil anything, either the hand or a piece of white linen, if rubbed upon it after it has been prepared for use.

Dr. Woodward. Where can that be obtained?

Dr. Lord. It is made by Weagant, of Ontario, Canada. It is the cleanest and purest copper amalgam that I have met with. It seems to be perfectly clean.

Dr. Bogue. As I look back in connection with this society some fourteen years and remember the experiments and analyses of amalgams that were then made, and the oblivion into which they seem to have sunk, these remarks seem queer. I want to second all that Dr. Lord has said in regard to Weagant's copper amalgam. It is white to start with, and that is not all. Dr. Lord alludes to copper always becoming black in the mouth. It does not always. It sometimes remains as white as when it was put in. And in those mouths I have fancied there was an acid diathesis, but I am not

sure. And if it can be kept white sometimes can it not be kept so always? I once wrote to Dr. Rollins asking him what kind of amalgam he had put in a certain tooth for a patient of his for whom I had been operating in Paris, and he replied that it was copper. Sullivan's copper amalgam, the first copper amalgam that we had, some twenty-five years ago perhaps, was intensely black and dirty; it discolored the boxes in which it was transported; but Weagant's is white and clean. Roger's or Stewart's is gray, and is intermediate in color between the other two.

In regard to washing amalgam, all this copper amalgam is washed in dilute sulphuric acid. It may be well enough to wash it again if you want to, but it should be made absolutely dry before using, and I do not know of any way of doing that without heat or time.

Dr. Niles speaks of mixing amalgam in the hand, and Dr. Lord speaks of the differences that exist between amalgams. It seems to me that we are at sea in both statements. First, we should not mix amalgam in the hand, unless it be copper. The alloys and mercury should be weighed and the proper proportion of the materials used. I think Fletcher's mode of weighing and mixing is admirable. He shakes the filings and mercury together in a small tube or vial. If after that you want to rub it in a mortar you can. The differences that I see in many amalgam fillings are simply the differences that have been hinted at all around the room this evening,—defective manipulation, occasioned through our own impatience or the impatience of our patients, the inaccessibility of the cavity, or lack of time; and I think I can see there reasons enough why the margins of fillings are not perfect. I fully coincide with Dr. Niles's remarks in regard to the general statements about amalgam being misleading. I think it is so. Nevertheless I think there are three heads under which we may divide pretty much all of our amalgams: palladium first, copper second, and third those which are mainly composed of silver, tin, and gold. I care myself very little what the accurate proportions of the metals are before I begin to use the mercury. Almost any of the ordinary amalgams can be made into good fillings. So far as palladium is concerned, it too needs to be known before it is used. It has to be weighed carefully, sufficient mercury put with it, and then mixed quickly and placed at once in the cavity. I prefer that the cavity should be varnished, which makes the amalgam stick to the walls when the first pieces are inserted; otherwise they may be pulled back with the instrument.

Dr. Perry. What varnish do you use?

Dr. Bogue. I prefer copal; perhaps, as Dr. Palmer says, from force of habit. I regard palladium as most valuable in all those

cases where you want to make immediately a strong and hard contour. I will fill sometimes an anterior approximal cavity with gold and a posterior approximal cavity with palladium, and make the palladium knuckle against the gold; and I know of no way in which I can do that at the same sitting except by the use of palladium.

Dr. Perry. Is that the chief reason for your preference of palladium? Is not that the real advantage of palladium, that it hardens so quickly that you can do that?

Dr. Bogue. Yes, that is one of the advantages of palladium. Dr. Perry spoke of a copper amalgam filling that he took out, or that tumbled out, and I was upon the point of asking him if he had not added mercury to the amalgam when he prepared it.

Dr. Perry. One filling came out; a large anterior surface lower molar filling,—the one I have already described. I did not want to let the color of the copper amalgam be seen, so I filled the bottom of the cavity with copper amalgam and the next day attempted to complete the operation with a gold contour filling, which had to be put in by hand pressure because the walls of the cavity were so frail; and yet with all my care I pushed off the inner walls, the whole thing came to pieces, and I had to take out the copper filling. That filling had been carefully placed as I supposed, but on examining it with a magnifying glass I discovered innumerable minute holes through it where it had not been properly packed against the walls. That was a surprise to me.

Dr. Bogue. I have been equally surprised to find about the same condition in the middle of a filling.

Dr. Perry. Probably it was too dry.

Dr. Bogue. No. I had added a little mercury; and I conceive that that is always bad. That is probably the main reason why many copper amalgam fillings have failed and wasted away. Another reason is the large quantity of oxide that is sometimes in them.

Dr. Littig. What does Dr. Bogue do when the amalgam is working too hard?

Dr. Bogue. I either mix more that is soft and add to it, or throw the first away and use the new.

Dr. Lord. It is a very nice point to heat the copper enough to bring out the mercury sufficiently, and yet not overheat. I have found that some of the buttons of Weagant's copper did not seem to have sufficient mercury, but when put into the pan a second time and heated a little more, there would be mercury enough.

Dr. Bogue. Dr. Perry asked about methods of packing copper amalgam. I would be pleased to give him my own method, which I think is altogether borrowed from my English friends. So far as

I know, copper amalgam was introduced to us through Dr. Claude Rogers. After softening it I rub it in a mortar; and if it is a thoroughly good and fine copper amalgam it generally gets plastic enough without manipulating it in the hands at all. Rubbing it in alcohol tends to soften it more easily. After getting it as soft as I want it I take a portion of the absolutely soft amalgam and place it in the bottom of the cavity; then squeeze the remainder out dryer and dryer until perhaps the last will be as hard as can be worked; pack the cavity full, or more than full, then take a bit of crystal gold, or Wolrab's gold, and heating it in the alcohol lamp wipe the whole surface of the filling as with a sponge. Of course the gold absorbs a quantity of mercury. Then throwing the gold aside I burnish over the surface with a burnisher.

Dr. Payne. How many minutes from the time you begin to pack copper amalgam before it becomes so hard that you can do nothing more than burnish it?

Dr. Bogue. I think I can arrange that to suit myself. I can have it harden in four or five minutes or in half an hour.

Dr. Payne. You govern that by the proportion of mercury?

Dr. Bogue. Yes. I want to avoid the crumbling condition which Dr. Perry speaks of. I put the very soft pieces in first, then that which is a little harder. I often pack it with a burnisher in the engine. Having shaped, or contoured, the filling—and I do not mean to make any but contour fillings—I press the gold over the whole surface. Knowing that the surface of the fillings is left somewhat spongy by that process of taking out the mercury, I go over it again with a burnisher to consolidate it.

Dr. Lord. Does Dr. Bogue think the filling is better for having less mercury in it?

Dr. Bogue. No, sir.

Dr. Lord. Is there not gold left on the surface?

Dr. Bogue. No, sir. It will not stick.

Dr. Niles. Will gold absorb mercury quicker than tin?

Dr. Bogue. Yes, sir, if heated.

Dr. Lord. Would it be objectionable to leave any of the alloys on the surface of a copper filling?

Dr. Bogue. I have never found any that would stick.

Dr. Lord. Not even if the surface were quite soft with mercury?

Dr. Bogue. I cannot answer that. I have tried a great many of them on the surface of copper fillings, and in my hands they would not stick. If the copper amalgam were less dry possibly they would stick. We were told the other night that we should not put either gold or tin on the surface of ordinary amalgams. I disagree with that somewhat. I would put tin if I were to put anything, or felt

foil, on my ordinary amalgam fillings, because I should expect to leave it there. That will stick to the surface; I can burnish it down and it will stay.

Dr. Littig. Do you mean Robinson's felt foil?

Dr. Bogue. I was thinking then of Slayton's.

Dr. Littig. Would Robinson's foil remain bright?

Dr. Bogue. I do not know. I have not used it. Slayton's does stay bright for many years in prominent positions. I very seldom mean to let an amalgam filling come to the grinding surface of a tooth.

Dr. Perry. Why?

Br. Bogue. Because I am afraid of breaking the tooth. I do not find the elasticity in an amalgam filling that I think a filling ought to have.

Dr. Niles. Dr. Bogue, where the surfaces of copper fillings are exposed do you see any objection to excavating them after a time and putting on a finish of gold to cover the discoloration?

Dr. Bogue. There is one objection, which is that copper amalgam is so intensely hard that there is great difficulty in making a good anchorage.

Dr. Niles. With cohesive gold?

Dr. Bogue. With any gold.

Dr. Payne. Would a spade drill in the engine penetrate it?

Dr. Bogue. You can do it, but not without difficulty.

Dr. Payne. It is not easy in the sense of penetrating an ordinary amalgam filling.

Dr. Bogue. That is what I mean. And it seems to me that there is always danger if the tooth is frail. I want as little mercury in the alloyed amalgams as possible. Why? Because in all the alloys we do get a change of form of the filling, which Dr. Dodge spoke of as a tendency to the spheroid.

Dr. Niles. Even in copper fillings?

Dr. Bogue. No, sir. In alloys. I recognize the fact that when shot is made it becomes spherical through the action of gravitation in its fall. Mercury turned upon a plate does the same thing. Mix a certain amount of alloy with it and it is still a spheroid. Mix twice as much, and it may flatten out, but still there is a tendency to the spheroid.

At our last meeting, Mr. President, a committee was appointed to examine and report whether vulcanizing could be done in glycerin. My young man, Mr. Fred Collett, concluded he would vulcanize in sand, and here are some pieces of rubber to show the results. I bring the matter up so that some of us may perhaps be induced to make further investigations as to whether there are not

some means of vulcanizing that will be free from the expense, annoyance, and danger of our present method of vulcanizing.

The President. Has Dr. Bogue a record of the time that was required in this vulcanizing?

Dr. Bogue. The vulcanizing in glycerin occupied an hour and ten minutes, at 320°, it taking nearly an hour to reach the proper temperature. The sand vulcanizing took one hour, fifty minutes being necessary to get the mercury up.

Dr. Perry. I want to ask one question of Dr. Bogue. He has enumerated some of the advantages of palladium, but he did not make mention of one of its qualities which it seems to me is a great disadvantage, and that is its extreme hardness. Of course the same quality belongs in a great measure to copper, both being very difficult to remove from a tooth. Is there not trouble growing for us in future years through the use of those perfectly hard materials that become almost impenetrable when placed in the teeth? If they fail we shall have great trouble in getting them from between the teeth. Is not that a point to take into account?

Dr. Bogue. It is. I was going to fire that at Dr. Perry when he spoke of approximal cavities that he would not fill with gutta-percha. I am very glad that Dr. Perry has spoken of that point, because I believe I see our friends right around us using copper amalgam in places where they will bitterly regret it inside of three years, for when decay supervenes the second time they cannot get it out. Now our friend Miller and our two friends Miles and Underwood, to say nothing of some of us here, have been investigating this troublesome subject of bacteria. If we had absolute cleanliness the question of bacteria need never be discussed; and I pretend to say now—and Dr. Lord, who is the most experienced one among us this evening, will bear me out in it—that when a dentist looks for cavities in a mouth which he has never seen before he looks in three places only: he looks where the enamel dips down and forms a deep crevice, either sulci in the top or the side of a tooth, or makes a dimple somewhere where there is no business to be a defect; and he looks between the teeth just below or above the point of contact; and he looks at the little creases near the margin of the gum. He don't need to look anywhere else. Why? Because the act of mastication and natural talking will keep the food from lodging upon other portions of the teeth. And where no lodgment of food takes place, and the health of the patient does not cause undue acidity of the oral fluids, there is no decay of the teeth that has yet been proven. I have a case of a man fifty-three years of age whose teeth are perfect in form and arrangement although they never have been brushed, and I hunted one hour for decay in them and found

only one cavity, and that one cavity was where a dentist had used a file. That man, fifty-three years of age, came to me with one of the most perfect sets of teeth you could find He has simply washed them with water after every meal, using two or three glasses. That is all he has done, and he has a clean mouth. Now on the other hand, some of you may remember a skull which I showed you, the skull of a child six years of age, where the twelfth-year molars were not erupted, and yet there were cavities in all four of them; cavities that no human power, other than a filling for each, could have prevented from developing into large cavities had the patient lived. No possible brushing could have kept them clean.

Dr. Payne. I understood that the inference you drew from this case of the man fifty-three years of age was that he had a remarkable denture because of cleanliness?

Dr. Bogue. He has a remarkable denture because he is able to keep his teeth clean notwithstanding his own neglect. They were well formed and well arranged, and so kept themselves clean very largely by the action of mastication, just as a dog or a wolf keeps his teeth clean.

Dr. Perry. That may be good reasoning, but we know that many persons take all the care of their teeth that can be taken and yet they decay.

Dr. Lord. Those teeth that Dr. Bogue speaks of would not have decayed if the gentleman had not cleansed them at all. I once had a patient who had the whole thirty-two teeth and no decay in any of them, and they had never been cleansed. Now I contend that teeth cannot be properly cleansed by rinsing the mouth with water, —they must be brushed between. There is where the teeth decay and where the cleansing must be done. I would not consider rinsing the mouth of much value unless there were spaces between the teeth.

Dr. Bogue. I heartily concur in the last remark of Dr. Lord; only I say that when Dr. Lord says he would not expect to get more decay on the approximal sides of teeth which have once been filled I think he is mistaken. We have had it once and I think we will have it again, unless the patient wholly reforms in his methods of care and becomes scrupulously cleanly. If we can persuade people to keep their teeth clean then we will not have any more decay.

Dr. Perry. I have some patients for whom I have for a great many years been forced, greatly against my wish, to put in shabby fillings of which I am ashamed, for the teeth are of that character that I feel they cannot be saved do the best I can, and I lose courage and resort to plastics.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

ANNIVERSARY MEETING, FIRST DISTRICT DENTAL SOCIETY.

At the afternoon session of the nineteenth anniversary meeting of the First District Dental Society of the State of New York, January 18, 1888, J. N. Farrar, M.D., D.D.S., of New York, read a paper entitled

Philosophy of Correcting Irregularities of the Teeth.*

Mr. President, Ladies and Gentlemen: The subject of my remarks this afternoon, the "Philosophy of Correcting Irregularities of the Teeth," is not wholly a new one, but the continuance and approximate conclusion of one that I began to talk and write upon in 1873, and is perhaps a clearer exposition of my views, which are, however, the same that I have always held and expressed since that time.

The title naturally suggests a treatment of the whole field of the topic, beginning at the time of presentation of the case and continuing to the final completion of the operation; covering not only the behavior of the alveolar tissues during the process of regulating, but the mechanics necessary to successful operation. On this occasion, however, it is my purpose to confine my remarks principally to the former,—the behavior of the alveolar tissues while the teeth are undergoing movements necessary to their correction as deduced from experimental observation,—touching upon mechanics only so far as to show their connection, as I prefer to leave that phase of the subject to the consideration of the audience, with the hope that we may obtain thereby, in the best way, the various views of those gentlemen who have given attention to special methods. In treating the aspect of the question selected for my theme, it is my desire not to say anything that will tend to provoke heated discussions, which are unfortunately apt to descend to personalities. If such discussions are ever in order, which I doubt very much, it is certainly not on such an occasion as this.

In the art of correction of irregularities of the teeth the necessary changes in their arrangement are accomplished in two ways: First, by the reduction of the alveolus through what is called absorption on one side of the tooth, followed by the growth of new supporting tissue on the other; and, second, by bending the alveolar tissue. If the highest rate of motion that is possible to attain with the least pain is desirable, then the importance of a knowledge of that which is necessary to secure this end must be apparent to all.

A few years ago these questions were new, or at least were not generally studied. Everything in the art appeared to be done by

guess-work; teeth were supposed to move from one point to another purely by the application of force, just as would a plummet of iron, if driven by force through soft wood; and so far as the character of force is concerned, it was believed that the manner of its application was unimportant, or at most only a question of the convenience of the operator. It seemed to be considered impossible to accomplish anything in these operations except through a swamp of pathological difficulties. For several years, as before stated, I have labored to convince my professional brethren that this is an error; that there are laws governing tissue-changes of which advantage can be taken, and that if this advantage were taken, great benefit would result to both operator and patient; but, judging from remarks that I occasionally hear and read, it appears that my views are not clearly understood by all.

As before said, teeth move by two processes, by retrogressive metamorphological action, more or less associated with absorption, and by the flexibility of the alveolar tissues. The term "retrogressive metamorphological action" is here used in a general sense to express what is sometimes called liquefaction, or a return to the embryonic conditions of the tissues, and the term "absorption" for the carrying away of tissue by the tissues. But to abbreviate I shall speak of both as absorption. To understand fully these physical acts in all their details requires further investigation, and although our microscopists have accomplished considerable in this line, I think that there is quite a field for further experiment.

In regulating teeth by what we will call absorption, which is a term intended, as above stated, to cover both of the before-mentioned changes, the tooth is made to plow its own way through the alveolar process, leaving a gap, so to speak, across which the pericemental fibers stretch, which interstitially fills with embryonic matter, that gradually organizes into that which finally becomes secondary alveolar tissue. Perfect reorganization of these tissues requires from one month to a year, sometimes longer, depending upon the age and condition of the patient. In brief, so far as the microscope has enabled us to understand this retrogressive and reformative process of alveolar tissue, the pressure of the tooth upon the socket-wall excites to liquefaction the bony portion impinged upon, which not only melts, so to speak, these harder portions of the structure, but apparently disorganizes and destroys the fibers extending into it from the pericementum. Whether this destruction of the fibrous connection is real or apparent, however, I think is not proven, for it seems to be a fact that, when reorganization of the hard tissue takes place, what appear to be the same fibers, that become invisible by the liquefaction, reappear. As

several of our best microscopists are present, I hope that we may hear from them regarding these questions, for upon this class of observers we not only much depend, but to them we feel indebted for their researches.

As is well known, physiological changes are healthy functional changes, but it may also be said that pathological changes may be nearly so, if not carried so far as to pass into what is denominated organic disease. But changes of tissue necessary to the movement of a tooth by retrogressive metamorphological action, or by what is denominated absorption, are not necessarily pathological. Even inflammation is not always organic disease; to a certain degree it is a physiological effort on the part of nature to throw off evil; but when it extends beyond what is called a stage of resolution, it may become degenerative. These conditions so merge one into the other that the boundary line can only be arbitrarily given.

As has been mentioned, in moving a tooth, its pressure upon the alveolar process causes decalcification of portions of the hard tissue, and some degree of impairment, if not devitalization, of the contiguous cells, which break down and are probably more or less carried off by the absorbents, which in turn are possibly stimulated somewhat by the same irritation that causes the liquefaction.

In childhood the teeth are easily moved by art, and the rate of absorption of old tissue and formation of new is nearly equal; but in proportion to the increase of age the teeth move more slowly, and the reproduction of supporting tissue is still more tardy. If the alveolar portion of a jaw-bone were composed entirely of cartilage, it would easily bend, but as it is more or less calcified, and becomes with increasing age more so, it is not very easy. Although this illustration is extreme, it will serve to explain the difference between the conditions of the alveolar ridge in childhood and those of adult age, and to show that in proportion to the degree of flexibility of the tissues, teeth can be moved in some directions faster than by absorption. The main cause of this flexible quality of the alveolus is not due to "vascularity of the bone,"—for it is no more highly endowed with vessels than are other bones,—but to the cartilaginous character of a large portion of this diploic tissue, which is more marked in childhood, becoming less so as age increases, but never entirely ceasing.

At birth there is but a slight degree of calcification in any part of the body: a provision of nature which prevents the injuries that would almost daily befall a child at the age before it has attained a sufficient degree of experimental knowledge to protect itself. But as the necessities of life call for efforts that develop physical strength, the bones are rendered more and more firm by exercise

and calcific deposit; and as the relation of the different parts of the physical economy is a unit, the changes in the alveolus very nearly correspond. While the thinness of the buccal and labial wall of the upper sockets admits of the rapid movement of teeth outward, on account of this flexibility, the greater thickness of the lingual wall renders the flexible character of the bone of little or no advantage. On the inner side, therefore, the movement of the teeth must mainly depend upon absorption.

In some portions of the lower jaw we find quite different conditions: while the walls of the sockets of six or eight of the anterior teeth are thin, and also the lingual walls of the entire arch, thus rendering the movement of the teeth in these directions easy and rapid, the outer walls of the molar sockets and sometimes those of the second bicuspids are so thick that the outward movement of these side teeth is slow, because mainly dependent upon absorption.

But although the inward movement of all the upper teeth and the outer movement of the lower side teeth, or a movement nearly horizontal with the alveolar ridge, can be accomplished mainly if not wholly by absorption, the outward movement of the upper or inward movement of the lower teeth by absorption alone would not always be for the best interests of the case; not so judicious as to take advantage of the flexibility of the alveolar tissue, because (to say nothing of the fact that the buccal and labial walls of the sockets may be weakened by absorption) it is a slower and more tedious process than is necessary. But when the rate of movement of teeth exceeds the alveolar flexibility, the strain will cause such injury to the tissues as will generally lead to pain. Therefore, to *insure* immunity from pain, it is necessary to confine the rate of movement within the limits of the flexibility. This statement, in connection with what I have said in some of my published papers concerning pain caused by overstepping the domain of physiological functions in moving teeth by absorption, may appear contradictory; but if you will follow me I think that I shall be able to show you that it is not so. Although, to insure against pain in moving teeth by absorption, the rate of motion cannot much exceed certain limits, it is possible to attain a more rapid rate when the case will permit of the bending of the alveolar tissues. Especially is this so if the ridge can be bent bodily. This "if" refers to the possibility of opening the mesial suture between the halves of the upper maxillary bones, in the operation for widening the arch,—the kind of operation to which my remarks are more especially applicable.

The theory of moving teeth by the bending of the process bodily is to avoid absorption by using sufficient pressure to bend the tissue before absorption has time to take place; but in practice this theory

cannot strictly be carried out, because the bending of the alveolus is accomplished by the pressure of the teeth upon the socket-walls, and therefore causes more or less tissue excitement, which leads to retrogressive change. The philosophy of this operation in such cases, mechanically considered, consists mainly in distributing the force along the line of the teeth, so that, while it will do the work desired, the degree of force will not be sufficiently great at any one point in the line to pervert the functions of the socket-tissues, by the strain incident to the bending process. While the sum-total of the force necessary to bend nearly the entire ridge on either side of the arch would not cause pain, the result might be quite the contrary if a sufficient degree should be applied to move only a section of it. In fact, it may be said that, other things being equal, the danger of perverting the functions of the tissues in these outward movements by rapid bending is in a measure in inverse ratio to the number of teeth acted upon. In this movement the question naturally arises, What are the differences between the conditions of sockets where the teeth have been moved by absorption alone and where too much force has been applied to only one tooth with the view of bending it? and, also, How do these two conditions differ from those brought about by moving a row of sockets at the same time by the bending process?

When a single upper tooth is moved outward by absorption it plows its own path through the cancellated portions of the alveolus to the external plate; but once there, instead of its moving further by absorption, the plate becoming decalcified by the irritation, so that its flexibility is increased, the tooth generally moves by the yielding of the plate before it, and, if the onward movement be persisted in long enough, the shape of the roots may be felt under the tissues by the finger. All these conditions may exist, too, without materially altering the original position of the adjacent teeth and the alveolar tissues about them. Although the outer wall of the socket is bent, the inner wall for a time is often slower in its movement; sometimes it apparently remains comparatively stationary. In a short time, however, both walls are found to have undergone changes of position and form,—the inner having moved up to the teeth, and the outer slightly thickening; the latter being a phase of action upon the part of alveolar tissue that is now recognized as induced by the presence of teeth. This is shown where the plane and shape of the sockets around the necks of the irregular teeth correspond with their position.

When several teeth, such as the upper bicuspids and molars, are together moved rapidly outward by force made to bear equally along the line, the crown and neck portions of the roots of the teeth

and their sockets all move together by the bending of the ridge, in a manner not unlike that in which a row of plants bends when acted upon by the wind; but while this portion moves, the apices of the teeth and base of the ridge remain comparatively stationary, —possibly the former moving slightly in the opposite direction through the alveolus, because the fulcrum of the teeth is at a short distance from the apex of the roots. Although the rate of movement by absorption can be and has been approximately ascertained, the flexibility of alveolar tissues varies so much at different ages that the latitude is not only considerably greater, but more difficult to tabulate. This is the point upon which some adverse critics have made their mistakes.

If at the time of beginning a rapid widening of the upper arch by screw-jacks, a plate be made so as to fit the roof of the mouth closely, the gums and the lingual walls of the teeth, it will be found after a few days that the action of the jacks has caused a separation between the outer portion of the plate and the gums, sufficient to make the plate rock on the middle portion of the roof of the mouth, and that if this plate be removed and substituted by a new one, made to fit, the movement of the teeth being continued, a similar change will take place between this plate and the gums. This proves that the ridge has been bent outward bodily.

As an illustration of the value of the operation for bending the ridge, take the case of an upper jaw so much smaller than the lower that the arc of the external plate of the upper ridge is less than that of the internal plate of the lower. In such a case, the widening of the upper arch sufficiently to make the teeth antagonize properly with the lower, would, if attained purely by absorption, cause great waste of socket-tissue, and leave the outer walls very thin, if not plowed completely through. To avoid this waste in some degree, the two arches may be moved in opposite directions sufficiently to be brought together midway; but by the bending process the upper teeth collectively may be forced at a sufficiently rapid rate to carry the sockets or alveolar ridge along with them, until proper antagonism with the lower teeth is secured, without altering the original position of the latter. If the degree of force is not carried beyond the proper limit,—which is generally best determined by the sensations of the patient,—this latter plan will not cause any suffering.

While the rapid movement of only one tooth may give pain because of too severe strain, the rapid movement of several teeth, as before said, is not so liable to injure the socket-tissues, for the reason that the degree of force that is requisite to move an entire line, although considerably greater than that which is usually necessary

to move one tooth, is so evenly distributed along the line that no tooth will be acted on by a force sufficient to cause much retrogressive change of the tissues.

If the greater number of teeth be already in proper position, little would be gained by trying to bend rapidly the sockets of one or two intervening irregular teeth, although it is sometimes possible to do so without starting the adjacent sockets and teeth. Even should it carry out to line a small, irregular section of the ridge, the attempt to bend such a limited section rapidly would be unwise, and the operation would perhaps end in failure, on account of the pain it would cause. This would not be the case if the plan by absorption alone were adopted. Even if absorption only partially enter into the process, it would be a painless success, provided that the rate of motion should not exceed the physiological functions. In fact, this combination of the two processes will be found to be the best plan in many cases; for this would by the slight decalcification of the tissue permit a rate that would exceed that of the normal flexibility of the alveolus; but the rate of motion of the teeth should not exceed the degree of the normal flexibility of the alveolus added to that derived from the decalcification brought about by the excitement from pressure of the tooth against it.

We do not know from actual observation exactly what takes place in the alveolar tissue while it is being bent, but enough is known of the acts of this tissue under similar circumstances to enable us through analogy to conjecture with some degree of accuracy; for it is natural to infer that a strain must excite the tissues in a manner somewhat similar to that in which the pressure of the teeth against the socket-walls acts, and, if so, must contribute to their flexibility.

Thus we may see that, although teeth can be moved more rapidly by taking advantage of the flexible quality of the alveolus, whether in its normal condition or when partially decalcified, than by its absorption alone, both may be carried on within the domain of physiological laws, if the operation be properly conducted.

The question now naturally arises, Will decalcification and absorption of the socket-tissues take place from the strain continuing after completion of the operation? Undoubtedly they will, to some extent, but the amount at most must be slight, and depends upon the degree of reactive tendency of the tissues. This is supported by the fact that when an arch has been widened by instruments and these are not removed, the devices in a few days will relax in their rigidity upon the teeth and become loose. Perhaps this may be more clearly understood by recognizing that absorption, when teeth have been moved by bending the ridge, has two phases, local and general:

local at points where the tendency of the ridge to return to its original position causes impingement against the teeth, and general whenever there remains a strain down deep in the tissues in the one side and a cramping on the other side of the ridge caused by the bending process.

As this ridge, after the operation for widening of the dental arch, is stayed by a line of teeth held in place by the retaining mechanism, the pressure will be so divided among the different ones that but little absorption can take place in the outer wall. Even if it exists at all, experience shows, as before mentioned, that the greater portion of the strain diminishes rapidly after the teeth are moved; consequently absorption does not long continue, and having ceased, the tendency is to a reversal of the process, resulting in a slight thickening of the outer wall. That there continues in the tissue after this time a slight tendency to return toward its former position, every dentist knows to be true, but this tendency does not appear to be sufficient to cause liquefaction of the tissue, or it would not be essential to use a retainer so long as we find it necessary in order to destroy this reactive tendency; a period of months, or perhaps years, depending upon various circumstances, such as the age of the patient and the cause of the deformity.

Notwithstanding all that has been said, it should be remembered that in all cases, even where rapid movement seems best, caution should be exercised as to the degree of force applied; for while the application of insufficient force subjects the patient to loss of time, the use of too great a degree of force may not only cause pain, but in operations for widening the arch may separate the two halves of the maxillary bones, which would not only render the completion of the operation more difficult, but would, unless the parts are brought together again, create a deformity, by causing a space between the central incisors. The possibility of this accident is due not only to weakness in the kind of interlocking of the opposite corrugations in the borders of the bones, but to the limited amount of such corrugated surfaces,—due to the thinness of the portion of the bones lying between the nasal and oral cavities. To be sure, such accidents are comparatively infrequent; still, their occasional occurrence being a fact, it is important to operate cautiously. If, however, separation of these bones takes place, there need be no alarm, as no permanent injury will result if the case is in competent hands.

Thus, this ridge of semi-provisional bone, consisting of a soft cancellated structure, covered with a thin shell of denser tissue, perforated with a row of conical wells extending from summit to base, offers to the dentist conditions that enable him to meet more easily the mechanical difficulties of regulating teeth, and to accomplish

greater esthetic changes than would be possible if these bones were as hard as most other bones of the system. In fact, when we consider that the force applied to the necks of the teeth causes them to act as levers upon the sockets, with one end fixed in the thickest portion of the base, where stability is most needed, and at the same time where the force applied acts least, while at the neck portion, which needs to be moved, the force is most powerful, and acts upon the weakest and smallest quantity of alveolar tissue, it is difficult to conceive how the conditions could be more favorable for moving teeth.

Upon the nature of the apparatus proper to perform these operations opinions differ. You all probably know my preference in most adult cases, and therefore it seems unnecessary to dwell upon the point; but I will say that, although I believe more strongly than ever that the screw is best adapted to meet these laws of the tissues, I do not now nor have I ever advocated dispensing wholly with the use of elastic materials as has been asserted; for there are some cases in which we cannot apply intermittent force in a manner that will move teeth as desired; in fact, it is not always necessary, as, for instance, with young children; and I do not assert that absorption cannot be carried on within the domain of physiological functions by the application of continued force, *if* the apparatus can be kept *under control*, so that the tissue-changes will be carried on within physiological functions. The question of pain depends upon properly controlling the force, applying it lightly if continuously, or periodically if greater. The latter, I think, is far more scientific, because it allows the tissues to act, and then grants them a period of rest. The question is not whether a certain plan may possibly be successful, but which plan is the best; not what is the easiest method for the dentist, but what is the most scientific method of performing the operation.

Discussion.

President Walker. Dr. S. H. Guilford, of Philadelphia, will open the discussion of this paper.

Dr. Guilford. Mr. President: I was especially pleased with the paper of Dr. Farrar,—in the first place, because he described so clearly and so well the pathological changes that take place in the moving of a tooth, or several teeth; in the second place I was a little disappointed, because I had expected that he would give us something to antagonize and something to discuss; but I was especially pleased that, according to my idea, he has made quite an advance in his views as compared with what he formerly advocated. It seems to me, if I understood his former articles correctly, that he

then advocated the employment of intermittent pressure in all cases. I am glad to see to day that he does not consider that essential in the case of the teeth of young persons. If he will go a little further, and say he believes continued pressure may be applied with advantage to permanent teeth, or any teeth, I think he will get on to good, solid ground. We all know what Dr. Farrar has done in this line, and we all admire and respect him for his work; certainly nobody appreciates it more than I do, and for that reason I was glad to see in this paper what I consider an advance from his former views. I have always, in a quiet way, antagonized his views, because I did not think they were based on sound principles, and were not in accordance with what my experience had taught me. In moving teeth I have been in the habit of using any and all appliances that seemed to be likely to do the work in the best manner, without regard to the age of the patient; that is to say, I would not divide patients as to age, and use continuous force upon the teeth of children and intermittent force upon the teeth of older persons. I have used intermittent and continuous force interchangeably in different cases, without regard to the age of the patient, choosing that which I thought would be best for the particular case.

I had been under the impression for a long time that Dr. Farrar believed that in moving a tooth the apex of the root moved, or could be made to move materially. I think he has expressed that opinion in some of his papers,—that he could produce a lateral motion of the tooth-crown and its root also by means of his appliances. That I have always been inclined to doubt. As a rule the apex of the root will move very little, if at all, while the crown moves a great deal. I believe he now says that when you move the crown of a tooth outward the root of that tooth is even inclined to move in the opposite direction a little way. I think that is true; for the reason that teeth are sometimes devitalized by a too rapid movement. In my practice I have been unfortunate enough to devitalize the pulps in two teeth through the injudicious application of force, and the question arises, How could that occur? Probably not through general irritation and inflammation set up by the pressure, but most likely by a slight movement of the apex of the root. It has been asserted by different writers and speakers that there was more danger in moving the teeth of children or young persons than those of adults, for the reason that there was danger of constricting the vessels of the pulp and thereby causing its death, they seemingly forgetting the fact that the foramen at the end of the root is larger in children than it is later on. In each of the two cases in which I was unfortunate, the patient was over twenty-one years of

age, and I have applied just as much force in moving the teeth of younger persons without a suspicion of any such result; therefore I believe that the death of the pulps was due to constriction of their vessels at the foramen.

Dr. Farrar said he would leave the discussion of the mechanical principles involved to others. There are two or three things in connection with moving teeth which I consider of the greatest importance. In the first place, I believe we can move a single tooth as rapidly as we please, within proper limits, without any interruption of the force applied, and with perfectly good results. I believe also that we can move a number of teeth in the same way with just as good results. The enlargement of the arch is accomplished not only by bending the outer plate of the alveolus and its absorption, but there is generally in such cases also a little yielding of the inter-maxillary suture; and a slight opening and widening of the suture is not detrimental unless carried to too great an extent.

We cannot now go into a discussion of the appliances for moving teeth, but there is one point of which I wish to speak. I think Dr. Farrar in his previous articles has been under the impression that because he applied intermittent force for the moving of teeth he gave very little, if any pain. Now, while I believe he gives his patients very little pain, I do not believe that it is due to intermittent force, because the same result can be attained by the continued application of force. When we begin to move teeth the irritation that is set up in their first movement is usually accompanied by a little pain; but after that the continued movement of the teeth gives no pain at all, provided we do not injure the soft tissues surrounding them. Formerly we were in the habit of moving teeth with rubber bands and silk ligatures, and these appliances around the necks of the teeth caused irritation of the soft tissues and considerable pain; but after we began to discard them or keep them entirely away from the gum we did not have any pain, or scarcely any to speak of; therefore we can get the same results by continued pressure that Dr. Farrar gets with intermittent pressure; and I think he was in error in attributing the absence of pain to the application of intermittent force. In moving teeth it is important to select appliances that will not be likely to injure the gum by undue impingement upon the soft tissues; and in that way you can move teeth just as rapidly as is practicable without causing any injury, and with the production of very little or no pain. The use of plates in this work is often very important, because if we must have anything resting upon the gum it is better to have something that covers a good deal of surface, and thus distribute the pressure.

In the matter of retaining teeth after they have been moved, I think many people make a great mistake. The teeth must be firmly held in their new position until new bone has formed around them. Wherever we can use retaining appliances that can be fastened to the teeth so as to hold them immovably during this period, I think it is the better plan, for the teeth then become fixed more quickly. If there is more or less motion of the teeth, they will not grow firm very rapidly.

Dr. E. S. Talbot. Mr. President and Gentlemen: Like my predecessor, I am very much surprised at the paper of Dr. Farrar, and very much pleased to see the change that has taken place in his views in the last few years in regard to the mode of regulating teeth. I expected when I came here to be able to say something antagonistic to his views, but I find that I am in accord with everything that he has said in regard to the mode of correcting irregularities of the teeth. He made two points,—first, that in correcting irregularities of the teeth we may move them slowly and produce absorption of the tissues by physiological processes on the one hand and the deposition of bone on the other; secondly, that we can force the alveolar process in any direction by bending it in carrying the teeth in that direction, but that the same process must take place in this condition,—that is, if we bend the bone, absorption takes place, and then deposition of bone must take place in the physiological way. The principle is precisely the same, only in the one we move the alveolar process, which is quite spongy and readily yields to pressure, and in the other we slowly follow up the absorption that takes place.

In regard to the force that can be applied (and of course this work must be done by force), there are only four or six mechanical forces that we can use in regulating teeth,—the screw, the wedge, the wheel and axle, and the inclined plane. All our appliances must come under these four conditions. Dr. Farrar has been fortunate enough to secure the best one of these forces in regulating teeth,—that is, the screw process. He has the advantage in moving teeth of holding fast what he gains,—it does not go back. His process is perfectly correct. It is the proper principle, in one sense of the word, in regulating teeth to get a slight absorption, and then a deposition of bone, and to hold the teeth as far as they have been moved. But lately we have another force which is not one of the mechanical powers,—the elasticity of metals; and the elasticity of metals is the coming force for regulating teeth. It is going to supersede all of the mechanical powers for regulating teeth. The elasticity of metals is not classified as one of the mechanical powers; but in most of the appliances which have been made lately and

which are most successful the force found in the elasticity of metals is the one used. We dentists are so busy with our operating that we do not like to be troubled with our regulating cases by having patients running into our offices every day or two to have the appliance adjusted or to make a new turn of the screw; and for that reason I prefer the elasticity of metal for doing the work. I want to make such an appliance as shall be perfectly comfortable in the mouth of the patient, and one which when the patient leaves my office I can feel assured will be in place when he returns again. I wish also to know that the appliance is doing good work in the mouth, as rapidly as possible, and that it will not bring the patient to my office more than once or twice a week. As an illustration of that method of operating I wish to quote a remark made by Dr. Shepard, of Boston, last summer. He said he made a spring appliance and placed it upon the teeth of the patient, knowing exactly what he wished to accomplish, and the patient went to Illinois, and spent the summer, or two months, and when the patient returned he found the work done and the teeth in place. That is the kind of work that I like to accomplish in the application of appliances for this purpose.

Now, I find in the piano-wire spring a force that will answer the purpose admirably. The apparatus is cleanly in the mouth, takes up but very little room, and can be bent and applied in any direction to move any teeth. Most of my appliances have been described and illustrated in the Dental Cosmos, for the benefit of the dental profession, as early as possible, and all of those appliances which have been illustrated in that journal are from cases in practice and have regulated the teeth represented. In the coil we have stored up a force like that of the storage battery, or the spring of a clock, that will work for three days or a week, and accomplish, if properly applied, what we intend it to do.

There are two points to be borne in mind in regulating teeth,—the point of resistance, and the point to be moved. In the one case the point of resistance must be so great or so powerful that it will resist the force applied to the teeth to be moved. The next thing necessary is to have an appliance which you know will apply the force exactly where you want it. I wish to have my point of resistance fixed and solid, and so small that I know the force applied from that point will carry the tooth in the direction I wish to carry it. Now, with the piano-wire we are able to accomplish those ends. I have here a model of an appliance illustrating that force. It is a case where the central incisors were rotated,—such a case as Dr. Farrar illustrates in connection with this principle, and such a case as Dr. Guilford illustrates with his principle of regulat-

ing. This is fine piano-wire, No. 27, the smallest size of piano-wire that is made. It takes up very little room in the mouth.

Dr. Kingsley. How old is your patient?

Dr. Talbot. The patient is twenty-six years of age; a lady. By holding this coil between the thumb and the forefinger you will see how small a force will accomplish these results.

I came prepared to criticise Dr. Farrar's paper, but I find nothing in it to criticise, so I shall have to cut my remarks short.

The President. Dr. Byrnes, of Memphis, Tenn., whose name is next on the programme, was unable to attend the meeting. He has sent some casts of regulating cases, which will be shown this evening; also a short paper, which will be read at the next meeting of this society. I will now introduce Dr. Jackson.

Dr. V. H. Jackson. Mr. President and Gentlemen: The subject has been so thoroughly covered by the gentlemen who have spoken that I do not know what remains for me to say upon it.

I have brought with me two casts showing work that has been accomplished; also some photographs of cases, that I would like to have the gentlemen examine carefully. They will show you that I believe in spring pressure for regulating teeth. I should advise any young man who wants to secure the most ease and comfort for his patients, with the least work in preparing his apparatus, to first study carefully the methods of making a small plate, with piano-spring wire attached, following the Coffin-plate method to a certain extent. The Coffin method is the best method for accomplishing simple regulating operations that I have ever used. In my practice I diverge somewhat from the Coffin method in many ways. I never allow myself to cover the teeth with a plate. I do not believe in breaking up or interfering with the articulation of the molars or bicuspids if it can be avoided. I retain plates frequently by extending piano-wire (or platinum and iridium) around the teeth,—in some cases around the distal surfaces of the molars, or between them, or the bicuspids, by separating the teeth to get space for the wire to pass through in order to clasp the tooth. In that way I have no trouble in retaining the plate in difficult cases.

If I may be permitted to make a few marks on the blackboard, I will describe some of the methods of making difficult work easy in regulating. [Drawing on blackboard.] In what way can we best contract the arch in this case; what method would most operators resort to in drawing the teeth into line where they are very much too prominent? In making an apparatus to draw the incisors and cuspids into the proper line, and articulate them with the lower teeth, the most practical method that I have discovered

would be to make a rubber plate covering the roof of the mouth, and coming in contact with those teeth that we do not wish to move. If we find by measurement that the arch is not large enough to contain all of the teeth when the prominent ones are drawn back

FIG. 1.

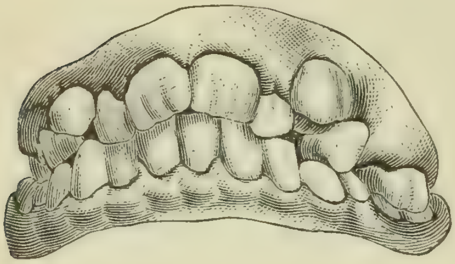
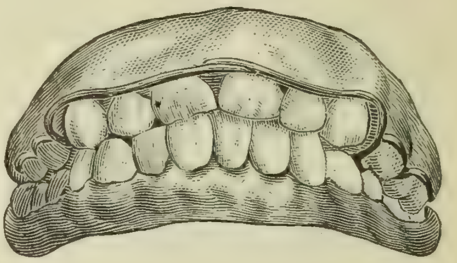
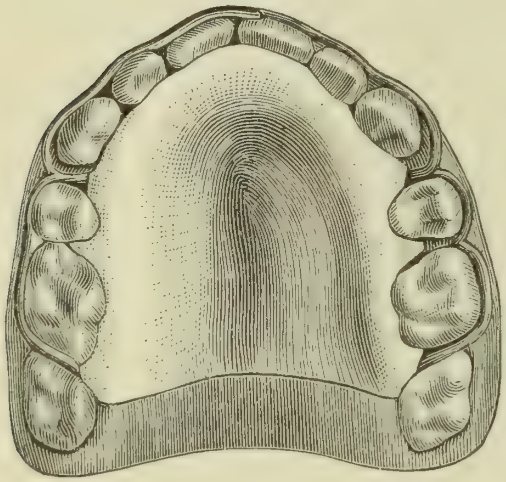


FIG. 2.



to their proper position, as we do in Fig. 1, I would extract the first or second bicuspid. I would extend a piano-wire spring from the plate,—a rather stiff one, but not too stiff (a slight pressure will accomplish more than would naturally be supposed by those who have not used the spring pressure),—passing between the bicuspids usually, and following around the front of the teeth in this form (see Fig. 2), from both sides of the arch, usually letting the ends pass a little by one another so as to mutually support each other. Now suppose the cuspids and the centrals are too prominent and the laterals are twisted, as in this case; the spring is bent so as to press all of the teeth in at once toward the rubber portion of the plate, the rubber having been shaped to fit any position it is desired to have the tooth take. (See Fig. 3.) If we find it is pressing too hard on any particular tooth, it can be remedied by bending the spring at any place required.

FIG. 3.



A Voice. Do you flatten the wire, or leave it round?

Dr. Jackson. I invariably leave it round, except where it enters the plate. Where it enters the plate it is necessary to bend or flatten it considerably.

A Voice. Do you cover the wire?

Dr. Jackson. I frequently cover it with a coat of tin; by first dipping it in chloride of zinc and then in molten tin. This is done in a minute or two, and prevents it corroding. I often use the wire without taking that trouble, where the work can be accomplished in a short time. There is no trouble from corrosion of the metal, in most mouths, for several months.

A Voice. These wires are loose?

Dr. Jackson. They are loose in the center, or are not united. This system is one of my own, and the nearest approach to the method is that described by Dr. Kingsley, in "The American System of Dentistry," vol. ii, page 351. In the case described by Dr. Kingsley the wire extends clear around, as far as the bicuspids. My method is the use of one or two independent springs, one from each side, or a single one to carry in one or more teeth, as the case requires.

A Voice. What would you hold those teeth in place with after you get them there?

Dr. Jackson. I usually use a platino-iridium wire, and make what I have termed a "crib," extending on both sides of the teeth, entirely around the arch, or a portion of the way as is thought best. It will be necessary to use clasp-benders if a very heavy wire is used; but almost invariably I bend it with the fingers, on a plaster model, making a sharp bend to fit between the teeth, and following around the arch back to the starting point and solder with gold; then take a thin piece of platinum plate that will pass between the incisors, and attach the wires with solder. At the distal part of the arch the wire can be extended over or between the teeth, as the case may permit. A more minute description of the "crib" will be found in the DENTAL COSMOS, vol. xxix, pages 374 and 377.

A Voice. Do you use flat wire?

Dr. Jackson. I always use round wire.

A Voice. You would have it so the patient can remove it, would you not?

Dr. Jackson. Yes, always. It is the most cleanly method of retaining that I have used. There are teeth which stand at such an angle that it would be hardly practicable; but I use this method in most cases, in the lower as well as the upper jaw.

As to the philosophy of the movement of teeth, I think the ground has been pretty well covered. We are instructed by Wedl that the bones of the jaws develop to a certain extent by interstitial growth, and after one has reached his majority the spreading of the arch is done principally by absorption or bending the bones. I have had results which led me to think that there had been additions by new growth to the marginal walls and the edges of the palatal bones. In cases where the angle of the tooth, or its shape, is such that the spring cannot be retained without slipping up, or tending to carry the tooth down, it is best to put a gold collar about it, with a lug in such shape that the spring may be retained, and made to press either downward or upward, as is desired.

I expected to present here to-day a method of carrying front

teeth forward and retaining them in position. I believe that teeth can be moved bodily without injuring to any great extent their pulps. I have succeeded in carrying them to some distance. I have caused the death of pulps by carrying teeth too great a distance, and too rapidly, however. We must consider when the lower arch is much larger than the upper, there has been from some cause an arrest of development in the upper. How does the upper jaw expand and enlarge? It is by the growth of the palatal bones from the edges, as well as by the interstitial growth spoken of by Wedl; and if we begin the regulating early in life we encourage that deposit which is necessary to enlarge the upper arch to the required size, or comparative size, of the lower one.

Dr. Kingsley summed up the discussion, and complimented Dr. Farrar on his admirable paper.

B. C. Nash, D.D.S., *Secretary*:

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The First District Dental Society of the State of New York held a regular monthly meeting, Monday evening, May 7, 1888, in the Hall of the New York Academy of Medicine, No. 12 West Thirty-first street.

The president, Dr. W. W. Walker, in the chair.

Dr. M. L. Rhein, chairman of the clinic committee, read the following

Clinic Report.

There were about sixty in attendance at the clinic this afternoon. . . . There was a very extensive exhibit of irregularities, both in the mouth and by means of casts. . . . Dr. Arthur R. Gage presented a young lady aged about twenty-five, who for the past two years has been showing only the point of the superior left cuspid. He desired to know how to bring about complete eruption of the tooth. He also presented a lad aged fourteen and a half years, in whose mouth the superior cuspids were in the position of the laterals. The temporary cuspids were still in position, but the permanent teeth could be easily felt above them. . . . Dr. Ed. T. Dobbs, of Brooklyn, exhibited a young man aged sixteen and a half years, in whose mouth there was a very bad condition of irregularity, entirely destroying the occlusion. Spreading of the superior arch was recommended. . . . Dr. F. W. Dolbear, of Brooklyn, presented models of a very ugly-looking deformity in a young lady's mouth, due to a very narrow arch, which required spreading. . . . Dr. C. S. Wardwell, of New York City, made a very interesting exhibit of his

labor-saving appliances for the various forms of dental engines. They consist of rubber wheels and rims and foot-pads for the treadle, and an adjuster by means of which the tension on the belt can be reduced to a minimum. . . . Dr. E. Parmly Brown, of Flushing, L. I., demonstrated the manufacture of his porcelain bridge-work, showing the results in the various stages of manipulation. . . Dr. H. A. Parr, of New York City, exhibited a spring appliance to prevent breakage of cables of dental engines. He also showed his new flux. . . . Dr. W. H. Mitchell, of Bergen Point, N. J., exhibited Parke, Davis & Co.'s latest form of hypodermic syringe, in a pocket case, with bottle of tablets ready for solution. . . . Dr. H. H. Sisson exhibited a neat contrivance for checking the waste of gas in the laboratory. . . . Dr. Chas. P. Grout, of New York City, displayed a superior central incisor just extracted, which had been replanted seven years ago. The root had been entirely absorbed, except one little portion in its palatal aspect, which seemed to have an osseous connection with the alveolus. . . . Dr. M. L. Rhein, of New York City, exhibited under the microscope specimens of a tooth implanted by Dr. Younger at our special clinic held October 15, 1886. It was extracted February 21, 1888. Two-thirds of the roots had disappeared through absorption.

Dr. C. S. W. Baldwin, of New York, here read a paper entitled

Some Recent Experiments in Crown-work.

Mr. President and Gentlemen: The short time given for the preparation of this paper necessitates the selection of a subject with which all are familiar, and it shall be the relation of recent experiments instead of an essay. As all new music is but the rearrangement of old melody, so new combinations in former methods may bring harmony out of discord or useful appliances from complications. Improvement in crown-work has been great and constant for several years, but most systems are so intricate that the busy operator will not change his accustomed method of plate-making for the more perplexing methods which he questions if any are able to accomplish in practical work. I have often been amused at a common remark of an interested patient who would say, referring to the dental engine, "The man who invented that must have had a big head," little thinking that it, like most inventions, was reached step by step,—a little improvement by one, perhaps a greater one by another. If I shall add a small improvement to those made by others, I shall consider my object attained.

In this work I have aimed at simplicity of method, bringing into use those materials already in the hands of the dentist, so far as

may be. I have succeeded in casting a metal die direct from the impression which may be used to strike up a seamless gold crown or cap, and assembled with a porcelain crown, which in my mind gives several hitherto unattained advantages in banded crown-work, without soldering or the accompanying investment.

In preparing the root, it may be most expeditiously cut squarely across by drilling a series of holes at the margin of the gum and grinding down with a corundum-wheel. Small projections partially under the gum may be removed with an enamel-chisel. Different sized twist drills are most advantageous in removing débris from the canal, and with a long fissure-bur it may be readily widened for the reception of a broad pin. A few cuts with a wheel-bur at various points in the inner surface of the canal give the necessary hold for the cement. The outer margin of the root should be beveled down the thickness of the gold used, giving regular sides for close adaptation of the cap. With this part faithfully performed there is no reason for ill-fitting ferrules to irritate the gum.

While this form of crown demands no greater attention at this point than any other ferruled crown, my observation leads me to believe that more failures occur from lack of bringing the root to regularity and the proper excising of projecting enamel than from any other reason.

The beveling instrument which I use has a shoulder that rests on the end of the root while the blade passes around it to the depth it is intended the ferrule shall extend. Being provided with rights and lefts of this form of hand instrument (Fig. 1), the work can be done rapidly and safely by resting the thumb on the root or adjacent teeth in supporting and guiding the instrument.

Much experimenting has been done by different operators in search of suitable material wherein to rapidly produce a die sufficiently hard and accurate for this work. Dr. Melotte made the nearest approximation,—producing casts of fusible metal in sealing-wax, which necessitated a female die, with its consequent extra labor. I have found several desirable qualities, and a new use as impression material for this work, in oxyphosphate cement. With this mixed as stiff as possible without crumbling, you can take an impression, forcing back the gum to give the required depth to the ferrule; and as it soon becomes dry and hard, the cast may be poured at once. In order to do away with the necessity of making and drying a special mold for each die, I find that an ordinary clay smoking-pipe, with a little preparation, gives a convenient form for the upper part of the mold. With a coarse file, cut down the under part of the bowl until an opening slightly larger than the root is made, taking care not to close or destroy the hole in the stem which

carries away the air, preventing bubbles in the cast. Place the impression below the pipe-bowl and lute together with more oxyphosphate or plaster of Paris. In the mold thus prepared pour melted zinc or Babbitt metal. To strike up the cap, place 32 gauge gold plate on a cushion of lead, holding the die firmly on the gold where you wish to produce the cap, and strike until the required depth is secured before removing it. This drives the gold and die into the lead, forming a female die and perfect-fitting cap at once, in less time than is occupied in describing the process. Trim the edges to fit the festoon of the gum, and drill a hole from the inner side for the pin, leaving the raggedness made by drilling to catch in the cement. Place the cap on the root and fit the porcelain crown accurately to it in the desired occlusion and position. A Logan crown can, with little grinding, be made to do good service (Fig. 2). A

Fig. 1.

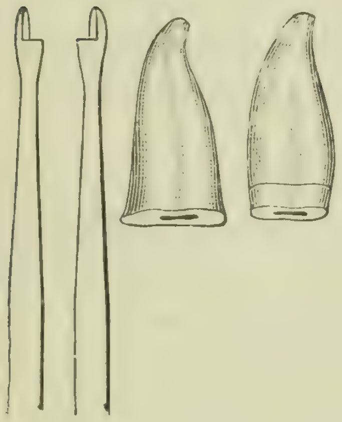


Fig. 2.

Fig. 3.

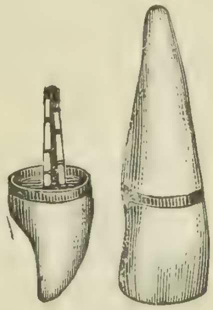


Fig. 4.

crown having the H-shaped pin, but square on the edge, like some of the early patterns of Logan or Bonwill crowns, would reduce the time of setting and give best results. Having polished the edges of the cap, the crown may be conveniently adjusted as follows: Place oxyphosphate cement in the countersunk portion of the porcelain, and in the canal only enough cement, of creamy consistence, to fill it, as the pressure required to force out the surplus under the edges of the cap destroys many nicely adjusted crowns, leaving bulging irritants instead of smooth supports. If proper attention has been given to fitting crown and root, all will come nicely to place, but in some cases of difficult adjustment it may be necessary to cement the crown to the cap before fastening the pin in the root (Fig. 3).

In my first efforts at this style of crown setting the nearly round platinum pin was used, which allowed the crown to turn in the root. In order to prevent this the cap was soldered to the pin with soft

solder, but by the use of the broad pin, fitted closely in the cap and thoroughly barbed, the necessity for solder is avoided.

In most cases the gold band will be invisible, and below the free margin of the gum. Cases may occur where the anterior teeth are prominent, and it will be necessary to cut away the top of the cap in front, allowing the porcelain to come directly in contact with the root, the band going deeper than in the ordinary case, which prevents the appearance of gold (Fig. 4).

This same method may be pursued in striking all-gold contour crowns. Take an impression of the corresponding tooth on the opposite side of the mouth, making the die as before described, strike up the cusps and unite to a properly fitting band.

Nothing has been said in this paper about medication or treatment. In my opinion, the pulp should be devitalized and the root in a healthy condition before crowning. Chlora-percha should be used to seal the end of the root in the manner common in treating pulpless teeth, with deodorized iodoform as a final root-dressing. I am aware there are those who object to any method of crowning where ferrules are used.

Without doubt the superior lateral incisors are the teeth requiring crowns the most frequently. It is just this frail class of teeth that need the extra support given by the ferrule and at the highest possible point on the pin. It may be noted in speaking of the superiority of this work, that it is the only style of banded crown-work which prevents the secretions of the mouth from lodging between the gold and porcelain, where they invariably become offensive. All wearers of gold plates soon discover that no amount of cleansing will sweeten the plate, and dentists usually give directions to boil them in an alkali. It is a wonder that more dentists have not caught on to the remedy for this difficulty. The ease with which this work can be performed,—nearly all at the side of the patient and outside the mouth,—the lessening of time,—nearly or quite one-half,—are advantages worthy of consideration.

Discussion.

Dr. A. L. Northrop. I would like to ask Dr. Baldwin if it is his universal practice to use a cap or ferrule in setting crowns.

Dr. Baldwin. I have usually represented to my patients that if they want to have the most desirable and best work I would use caps. Some patients are not able to pay for it. I explain the difference; and if they want something that is less expensive I put on the ordinary Logan crown. But I have yet to see the case where a ferrule cannot be used to make the work more desirable.

Dr. Ottolengui. I had a case recently in which all the teeth were

in position with the exception of the two bicuspids, both right and left superior, and the crowns of those teeth were entirely absent, and the roots partly gone, too. I told the patient I would attempt to put crowns on. I selected what I supposed was the best of the four roots, the first bicuspid, and after clearing away the decay and débris I found much less root than I expected. We know that in cases where crowns have been long absent the occlusion becomes very close, the teeth in the opposite jaw elongate and the bite is shorter. In this case the palatal wall was so far gone that it was a long distance up under the gum, and the labial walls were in almost as bad condition; all around it came to a feather edge. I think I would defy any one to put a ferrule on that root. I succeeded in putting on a Logan crown, however. I used a cuspid, as being better adapted to the short bite. That tooth is now in the mouth and apparently strong. It is buried half of its length under the gum in order to reach the attachment. I mention the case as showing that the Logan crown is useful in very desperate cases.

Adjourned. B. C. Nash, D.D.S., *Secretary*.

AMERICAN MEDICAL ASSOCIATION.—SECTION OF ORAL AND DENTAL SURGERY.

REPORTED FOR THE DENTAL COSMOS BY F. W. SAGE, D.D.S.

The thirty-ninth annual session of the American Medical Association was held at Cincinnati, commencing Tuesday, May 8, 1888, and continuing four days. There was a large attendance of delegates, nearly every State and several of the Territories being represented.

The officers of the association for this session were: A. Y. P. Garnett, Washington, D. C., president; Duncan Eve, Nashville, Tenn., Darwin Colvin, Clyde, N. Y., C. J. O'Hagan, Greenville, N. C., and H. Stedman, Denver, Col., vice-presidents; Richard J. Dunglison, Philadelphia, treasurer; W. B. Atkinson, Philadelphia, permanent secretary; Joseph Ransohoff, Cincinnati, temporary secretary; C. H. A. Kleinschmidt, Washington, D. C., librarian; W. W. Dawson, Cincinnati, chairman of the local committee.

The officers of the section of Oral and Dental Surgery were as follows: J. Taft, Cincinnati, chairman; E. S. Talbot, Chicago, secretary.

The general sessions of the association were held in Music Hall, President Garnett in the chair.

The following officers were elected for the ensuing year: W. W. Dawson, Cincinnati, president; W. L. Schenck, Kansas, first vice-president; Frank Woodbury, Philadelphia, second vice-president;

H. O. Walker, Mich., third vice-president; J. W. Bailey, Ga., fourth vice-president; R. J. Dunglison, Philadelphia, treasurer; W. B. Atkinson, Philadelphia, permanent secretary; C. H. A. Kleinschmidt, Washington, D. C., librarian; E. M. Moore, New York, John H. Hollester, Ill., and Joseph M. Toner, Washington, D. C., trustees; M. A. Phillips, Kan., A. M. Pollock, Penna., W. C. Van Bibber, Md., J. F. Hibberd, Ind., Chas. S. Wood, N. Y., J. McF. Gaston, Ga., W. H. Q. Taylor, N. Y., and Geo. S. Porter, Conn., members of the judicial council.

Newport, R. I., was selected as the place for the next meeting, and the first Tuesday in June as the date for the opening session.

First Day.

The Section of Oral and Dental Surgery met at 3 o'clock P.M., Chairman Taft presiding.

The chairman read an address on the "Progress of Dentistry," of which the following is a synopsis:

Many factors enter into the determination of true progress,—none more important, perhaps, than time. The merit and value of some things are apparent upon first presentation; more commonly, however, a process or an idea that seems at first an advance, fails upon being fully tested. Retrospection extending over a decade shows real progress in the profession. True advancement consists in the elevation and improvement of the largest possible number of those engaged in any special calling,—not in the achievements of an occasional genius whose attainments cannot be made available by those of average culture and ability. Constant improvement in educational work in the department of dental and oral surgery is noticed with gratification. Organized efforts by the faculties of a majority of dental colleges of this country indicate advance, and give promise of greater things in the future. Uniform and improved methods of teaching are being discussed and adopted, a better class of students apply at our schools; association work has been more efficient and engages larger numbers than ever before; and a closer alliance and a more harmonious relation with general medicine has been cultivated. The tendency towards specialties in medical practice has awakened needless apprehension that the science as a whole might retrograde. Many, nevertheless, maintain that specialists should receive preliminary training in general medicine, first acquiring the degree of M.D. Medical colleges almost all to-day wish to establish corps of teachers of dental and oral surgery in their faculties. The establishment of a section of dental and oral surgery in the International Medical Congress, in 1881, was regarded by some as an un-

satisfactory experiment which would never be repeated. The efforts of the past year have given that prophecy a significant contradiction. With so much difference of opinion as existed for two years, prior to the establishment of this section by the International Medical Congress last fall, it accomplished its work successfully and creditably. For the future, it becomes us to study how best to direct and use the influences, agencies, and instrumentalities that have contributed to the vigorous growth of the profession; to employ them legitimately and effectively.

Dr. W. W. Allport, Chicago, said that during the reading of the paper his thoughts had reverted to a period forty years ago, or more, when dentistry was regarded as a mere trade. When Dr. Harris first attempted to make it a separate department of medicine, he had no intention of establishing a school as a branch independent of medicine, but to make dentists, as far as possible, medical men. The teaching at that time was limited to a few branches of medicine. To-day some of our best schools are connected with medical colleges, and have the same teachers,—something which Harris probably never anticipated. Henceforward the basis of our improvement must be, not in mere manipulative skill, but in the broadening of our medical education.

Dr. Eugene S. Talbot, of Chicago, read a paper entitled "Etiology of Irregularities of the Teeth; Development of the Superior Maxilla in the Idiot, Deaf, Dumb, Blind, and Insane,"* which he supplemented with illustrations upon the blackboard. In the course of his remarks he referred to Mr. Tomes's statement that the V shape or pinched condition in the bicuspid region is the result of tonsillitis, and that the child sleeping with opened mouth, the pressure of the buccinator muscles upon the sides of the roots causes contraction in that region; and to Mr. Coles's expressed opinion that the premature ossification of the sutures of the base of the cranium acts as a direct force upon the incisive bones, thus causing protrusion of the jaw in that locality. His (the speaker's) theory is that the cause of irregularity in the teeth of late generations is a smaller *superior* maxilla. This bone is gradually decreasing in size, though the teeth themselves have never changed in size; they are no larger nor smaller than they were three thousand years ago. Since they calcify from the periphery towards their centers, they are not liable to possible variation from a normal size, such as may obtain in the case of bones, in which the process of calcification follows the reverse order. The nature of the irregularity caused by arrest of, or retard-

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* See page 453, current issue.

ation of, development in the cranial bones, refers to the V shape or the saddle shape which is imparted to the jaw-bones. We do not find the V-shaped deformity in the lower jaw, and rarely the saddle shape. Again, the alveoli, whose development is modified largely by the teeth, should be regarded as separate bones. Irregularities do not exist among the Chinese, Indians, Negroes, and other races with large, wide jaws. He does not believe in hereditary irregularity of the teeth. The *tendency* only is inherited. The small maxilla *is* inherited. There is no such thing as congenital deformity, either.

Dr. John S. Marshall, Chicago, thinks the use of the term "high-breeding," in Dr. Talbot's paper, a misnomer. Where cousins intermarry, as they do in Europe, in order to entail property in the same family, we find a process of degeneration going on, which might better be termed *low*-breeding. That is quite different from intermarriages among the Jews, for instance, where selection is made with proper regard for distant relations of consanguinity. In the human family no such deliberate consideration looking to the improvement of the species obtains, where marriage is contemplated, as is kept in view in the breeding of animals. Even if the most judicious selections were made, improvement could not be infallibly predicated, since we find in the analogous cases of animal breeding, that improvement in one or more features, as in size or speed, may be effected at the expense of some other quality, as endurance. Now as regards the tendency of the superior jaw to decrease in size; if you go among the negroes of the South, where they intermingle with the whites, you find the offspring of the crossed races exhibiting strikingly in their facial features the imprint of the Caucasian,—you will mark the straight nose, the thin lips, the long head and narrow face of the Anglo-Saxon race. The Anglo-Saxon—the highest type of man at this day—dominates the lower races. The greater the development of the brain, the longer the head. And in this instance we have, furthermore, an illustration of the dominant race giving size to the jaw. But the negro blood also prevails to limit the modification, just as the Morgan horse, in spite of interbreeding, still impresses the peculiarities of the progenitor upon the offspring.

Dr. J. Taft. When will all this stop?

Dr. Marshall. It will stop when we have finally reached a new type. That time has already come in New England, where, as the result of much intermarrying, you will find a distinct type of physical formation,—long arms, legs, and faces, narrow jaws, and good brains. In the West, where Germans, Swedes, Norwegians, etc., are congregating, there is no settled type. But there will some day

be a distinctly recognizable type known as the American. Look at the admixture in England to-day,—Roman, Dane, Saxon, Norman. And now, after all these generations, they have their distinct type, and we can all recognize it.

Dr. H. A. Smith asked Dr. Talbot to explain how the loss of the teeth could modify the shape of the jaw.

Dr. Talbot. As stated, the development of the alveolus is dependent largely upon the teeth. It fills up around them, in whatever position they may present. If we extract the sixth-year molars or the temporary molars, one generation after another, the alveolar process will not develop, and that is one of the local causes of a smaller maxillary bone.

Dr. Smith. How about the lower maxilla?

Dr. Talbot. The lower jaw being movable, receives more exercise, promoting a more liberal blood-supply.

Dr. Taft. Is the jaw outside of the alveolar process growing smaller?

Dr. Talbot. Yes. It is easily demonstrated with models.

Dr. Betty. Dr. Talbot failed to notice the fact that the lower third molar is far larger than that of the upper jaw, which helps to confirm his view.

Second Day.

Dr. John S. Marshall, of Chicago, read a paper entitled "Fractures and Diastasis of the Superior Maxillæ and Upper Bones of the Face, treated by the Aid of the Interdental Splint," an abstract of which is subjoined:

Fractures of the superior maxillary bones are, from their protected location, rarely met with, excepting in the alveolar process. The common causes are extraction of teeth, blows, and falls. Such injuries rarely require special apparatus to maintain the fractured bones in position. The more serious classes of injuries included under the above title have received very little attention from either the specialist or the general surgeon. Several noted works on surgery make no mention whatever of them. This is probably due to their rare occurrence. Two cases recently under my care have led me to some inquiry, with the result of discovering only nineteen cases (described in text-books and current literature bearing on this subject) similar to these to be presented.

Case 1. Mr. Conrad A., Swede; age twenty-five years; occupation, sawyer. On March 15, 1887, he was struck by a heavy block of oak, thrown from a circular saw, the result being an incised wound beginning at the inner canthus of the right eye and extending obliquely backward and downward a distance of four inches. Right malar bone crushed, both nasal bones fractured and separated

at the naso-frontal suture. The left zygomatic process was fractured near its union with the malar bone, both superior maxillæ were torn loose from the bones of the cranium, so that the whole mass was loose, freely movable in any direction, being suspended by the soft tissues. When the mouth was opened to its fullest extent the teeth of the upper jaw rested upon those of the lower. Both superior maxillary bones were also fractured on a nearly perpendicular line, on the right side between the first and second molars, on the left between the first molar and second bicuspid. Openings into both antra existed. The right could be entered with a probe through the wound in the cheek and also through the alveolar process on the buccal aspect between the roots of the first and second molars, while the left could be entered through the buccal surface of the alveolar process on the line of the fracture between the second bicuspid and first molar. The palate process and palate bones were also badly crushed, forming a compound comminuted fracture with loss of bone-tissue, leaving an opening in the hard palate on the right side, near its posterior edge and the median line, through which a finger could be passed. The bones of the internal nose were badly comminuted, and several loose pieces were removed. The left side of the face was completely anesthetized over the whole region supplied by the infraorbital nerve, while upon the right side the upper lip and the wing of the nose only had lost sensation. The inferior maxilla and all the teeth of both jaws escaped injury.

The patient's prospects for recovery seemed slight. Cold applications were ordered over the face, and hypodermic stimulants directed should the pulse decline below 60, and the temperature below normal. Nourishment to be given, if possible. One-fourth grain morphine also prescribed. The next day both eyes were closed and the nasal passages completely plugged up by swelling of the parts. Pulse 84, temperature 101.8°. Would arouse when spoken to.

March 17. Patient rallied. Pulse 74, temperature 100°. Seemed conscious. Swelling less. On the 18th his temperature was normal and did not thereafter increase. Improvement rapid from that date. Treatment of the jaws was begun on the 17th, consisting in wiring the posterior fragments of both superior maxillæ to the anterior or middle portions, silver wire being used, attachment being made around the teeth. The fractured palate bones and the palatine processes were then molded into place as nearly as possible with the fingers, and the nasal bones lifted into position with the handle of an instrument. The lower jaw was then closed upon the superior teeth, care being taken to get a correct occlusion, and was held in position by means of an occipito-frontal and an occipito-mental bandage. The nasal passages being closed occasioning difficulty in

breathing, the patient tore off the bandages several times during the following night. They were then applied more loosely, but this allowed the injured bones to fall out of place, defeating the object in view. The nostrils remaining closed for several days, necessitating breathing through the mouth, I was compelled to devise some means of supporting the fractured bones in position, so as to leave the lower jaw free to be opened. The principle of the Kingsley interdental splint was employed. Impressions of the upper and lower teeth were obtained by using modeling compound, first molding it to the upper teeth and then forcing the lower jaw upward until a correct occlusion of the teeth was obtained. A one-eighth inch steel wire was imbedded in the sides of the impression, upon a line with the ends of the teeth, this being bent backwards upon itself opposite the cuspids, and allowed to extend outside the cheek nearly to the lower edge of the ear. From this was constructed a hard rubber splint, with the wire attached. The splint was held in position by means of double straps attached to the wires on each side, and buckled to a close-fitting leather cap, laced firmly upon the head. This proved a very successful appliance, holding the bones in proper position, permitting comfortable breathing and free movement of the lower jaw. He was enabled to talk, and after a few days to masticate soft food. Deep indentations were left in the under side of the splint, into which the lower teeth fitted perfectly when the mouth was closed. This was to furnish a sure guide to the normal position of the upper maxillæ. Without this, the correctness of the adjustment of the bones could not have been verified. The importance of this cannot be overestimated. The only other treatment was good food and thorough irrigation of the wounds, antra, and the mouth with a two-per-cent. solution of carbolic acid every two or three hours until the discharge ceased. A few spiculæ of bone were removed from the nose and the right antrum. The patient was discharged on May 14, several small fistulous openings through the gums leading into both antra at the points of fracture still remaining, also a small opening in the hard palate, which gradually grew less. There was also a slight deflection to the left of the nasal septum. The opening into the right antrum soon closed, as did that into the hard palate.

June 22. Patient returned for the removal of the cicatrix in the right cheek, which was adherent to the maxillary bone.

June 25. Stitches removed and patient discharged. The opening into the left antrum remained patulous for several months, with slight discharge into the mouth, but finally closed. Sensation on both sides of the face was fully restored.

[Dr. Marshall exhibited casts showing almost perfect occlusion of

the teeth after recovery. He also showed photographs taken before the accident, during treatment, and after recovery, from which it appeared that the patient had escaped with very slight disfigurement.—REPORTER.]

Case 2. Henry S., German; age thirty-five; occupation, laborer. On October 7, 1887, was struck on the bridge of the nose by a descending elevator. Was suffering from brain-concussion. There was a lacerated wound over the left eye extending across to the right eye. The finger could be introduced and readily passed down into each orbit and against the fractured edges of the nasal and sphenoid bones. All the bones of the upper face were movable, so that when the mouth was opened the upper teeth rested against the lower, giving a peculiar appearance of elongation to the face. The frontal sinus was crushed in, the nasal and lachrymal bones comminuted, all the bones of the face torn loose from the skull on a line passing through the orbits. The superior maxillæ were separated from the other bones of the face. Inferior maxilla uninjured. Several loose pieces of bone were removed from the region of the inner canthus of each eye, by a surgeon. The wound was stitched, drainage-tubes inserted, the lower jaw bandaged tightly against the upper teeth, and iced cloths ordered over the face and head. Pulse 60; temperature 97.4°. Stimulants freely administered. Profuse hemorrhage occurred during the night, and frequent vomiting of blood until 2 o'clock the next day. Became conscious during the night, but the other symptoms gave little hope of recovery. On the 8th, at 4 o'clock P.M., the temperature reached 102.2°. On the 9th it became normal. No brain-symptoms developed, and the patient rapidly improved in general condition from this time. For several days swelling and suppuration were so extensive as to render the adjustment of a splint impracticable. The method of bandaging which had been adopted was found open to the objection of obstructing breathing, as in Case 1. On October 24 the form of interdental splint described in the first case was employed. The case progressed favorably, and the patient was discharged on December 3, the bones having all united. On December 24 the patient returned, complaining of double vision. The lens of the left eye looked clouded, and traumatic cataract was feared. April 1, 1888, the patient seemed entirely well. Double vision had disappeared and the lens had cleared up. The occlusion of the jaws was good. The loss of portions of the nasal bones and the external walls of the frontal sinus, together with the adhesion and contraction of the cicatricial tissue over these places, have caused some deformity.

(To be continued.)

IOWA STATE DENTAL SOCIETY.

The twenty-sixth annual meeting of the Iowa State Dental Society, in Iowa City, May 1 to 4, 1888, proved very interesting to the nearly two hundred dentists present.

Historical addresses on the origin and progress of the society were given, together with papers on "Histology as a Fine Art," "Aluminium in Prosthetic Dentistry," "How can we best Promote the Development of Dentistry?" "A Talk on New and Original Illustrations of the Tooth-pulp as a Ganglion," "Teeth from a Zoölogical Standpoint," "Primitive Dentistry in Iowa," "Nitrous-Oxide Gas and its Administration," "Epulis: What is it? Its Pathology and Diagnosis," "How can we best Serve our Patrons?" "Diagnosis," "Are the Natural Teeth Saved at the Expense of Health and Life?" "Porcelain Settings in the Visible Surfaces of the Anterior Teeth," "Illustrated Work in Dentistry," "Amalgam and Soft Gold," and "Irregularities." Several of the papers were illustrated, and numerous clinics served to practically exemplify a great variety of useful methods, appliances, and devices.

The Dental Department of the State University furnished facilities and a meeting-place for the society, which has reason to congratulate itself upon its rapid and substantial progress.

Des Moines is the place of meeting next year, and the officers are as follows: J. B. Monfort, president; L. K. Fullerton, vice-president; G. W. Miller, Winterset, secretary; F. M. Shriver, treasurer; F. R. Rose, Jessie M. Ritchie, and C. G. Thomas, executive committee; F. L. James, J. S. Kulp, and C. G. Thomas, membership committee; H. W. Schriver, L. E. Rogers, and W. H. Baird, committee on dental art and mechanism; A. Wood, E. L. Brooks, and G. W. Miller, publication committee; S. A. Garber, W. H. DeFord, C. J. Peterson, and Z. A. Hallitt, committee to examine candidates for graduation in the Dental Department of Iowa State University, March, 1889. The Iowa State Examining Board consists of J. Hardman, president; S. A. Garber, Tipton, secretary; J. F. Sanborn, and J. T. Abbott.

NATIONAL ASSOCIATION OF DENTAL EXAMINERS.

The next meeting of the National Association of Dental Examiners will be held in Louisville, Kentucky, on Monday evening, August 27, 1888, at eight o'clock, and at other times during the week, between the sessions of the American and Southern Dental Associations. It is important to have every State board represented.

Fred. A. Levy, D.D S., *Secretary*, Orange, N. J.

MISSISSIPPI STATE DENTAL ASSOCIATION.

The Mississippi State Dental Association held its thirteenth annual meeting at Grenada, Miss., May 15 to 18, 1888.

The following officers were elected for the ensuing year: W. H. Marshall, president; R. K. Luckie, first vice-president; D. B. McHenry, second vice-president; J. B. Askew, third vice-president; A. H. Hilzim, recording secretary; E. E. Spinks, corresponding secretary; and C. C. Crowder, treasurer.

The next meeting will be held in Vicksburg, commencing on the third Tuesday in May, 1889.

E. E. Spinks, *Cor. Secretary*, Meridian, Miss.

CALIFORNIA STATE DENTAL ASSOCIATION.

The nineteenth annual meeting of the California State Dental Association will be held in San Francisco, commencing on the third Tuesday in July, 1888, the sessions to continue for four days.

W. Z. King, *Cor. Secretary*,
No. 1001 Valencia St., San Francisco, Cal.

CONNECTICUT VALLEY AND MASSACHUSETTS DENTAL SOCIETIES.

The Connecticut Valley Dental Society and the Massachusetts Dental Society will hold a union meeting in Boston on the 10th, 11th, 12th, and 13th of July next, at the Institute of Technology.

All the dental societies in New England will be invited to unite with them, so that the meeting promises to be the largest ever held in this part of the country. Programmes can be obtained upon application to the secretary of either society.

G. F. Eames, M.D., D.D.S., *Sec. Mass. Dental Society*,
62 Trinity Terrace, Boston, Mass.
Geo. A. Maxfield, D.D.S., *Sec. Conn. Val. Dental Society*,
Holyoke, Mass.

NEW JERSEY STATE DENTAL SOCIETY.

The eighteenth annual meeting of the New Jersey State Dental Society will convene at the West End Hotel, Asbury Park, N. J., on Wednesday, July 18, 1888, at 10 o'clock A.M., and continue its sessions until final adjournment.

A cordial invitation is extended to dentists to be present.

Charles A. Meeker, *Secretary*,
21 Fulton St., Newark, N. J.

MINNESOTA STATE BOARD OF DENTAL EXAMINERS.

The Minnesota State Board of Dental Examiners will hold its next regular meeting, for the purpose of examining applicants for permission to practice in the State of Minnesota, at Ryan Hotel, St. Paul, on Tuesday, July 10, 1888, at 10 A.M., the day preceding the meeting of the State Dental Society.

C. W. Merry, *Secretary*, Stillwater, Minn.

SOUTH CAROLINA STATE DENTAL ASSOCIATION.

The eighteenth annual meeting of the South Carolina State Dental Association will be held in Greenville, S. C., commencing on Tuesday, July 24, 1888.

Members of the profession are cordially invited to attend the meeting and participate in the discussions.

The State Board of Dental Examiners will meet at the same time and place.

L. S. Wolfe, *President*, Orangeburg, S. C.
E. C. Ridgell, *Cor. Secretary*, Batesburg, S. C.

MAINE DENTAL SOCIETY.

The twenty-third annual meeting of the Maine Dental Society will be held in Portland, July 17 and 18, 1888.

E. C. Bryant, *Secretary*.

JOINT MEETING OF THE GEORGIA STATE DENTAL SOCIETY AND EAST TENNESSEE DENTAL ASSOCIATION.

A joint meeting of the Georgia State Dental Society and the East Tennessee Dental Association will be held at Dalton, Ga., August 22 to 25, 1888.

The Georgia State Board of Dental Examiners will meet at the same place, on Tuesday, August 21, 1888. Every person commencing the practice of dentistry in the State of Georgia since October 9, 1885, must have a license from the Examining Board. There are no exceptions.

L. D. Carpenter, *Cor. Secretary*,
No. 47½ Whitehall St., Atlanta, Ga.

CORRECTIONS.

To the Editor of the Dental Cosmos:

In the discussion on a paper read by me before the Odontological Society of Pennsylvania, Dr. Essig is made to say, "Dr. Chupein is mistaken when he says that teeth cannot be attached to silver plates by means of rubber." I did not say that this could not be done, *as I have done it*, but I did say that, if the silver plate were *electro-gilded*, rubber would not harden on a silver plate so prepared,

as the silver had such an affinity for the sulphur in the rubber that it seemed to appropriate it to itself through the film of gold. Silver plates prepared by tinning the surface against which the rubber is to rest can readily be used with rubber attachments.

THEODORE F. CHUPEIN, Philadelphia, Pa.

TO THE EDITOR OF THE DENTAL COSMOS:

IN the May number of the DENTAL COSMOS, page 347, the clinic report erroneously states that I used a "Donaldson broach to remove free tartar." I used Allport's instruments with a push motion, and then, after thoroughly protecting the cheeks, tongue, and all healthy parts with napkins and bibulous paper, and drying the gums and pockets with bibulous paper, I used a Dunn syringe and peroxide of hydrogen to thoroughly wash out the pockets; after which, and again drying the gums and pockets with bibulous paper, I wound absorbent cotton on a Donaldson nerve-broach, and carried to the bottom of each pocket a thick solution of wood creasote and iodine crystals. Still keeping the parts protected and the gums dry, and allowing some time for the absorption of the iodine, I dipped a cotton-wound broach in a honey-thick solution of glycerin and tannin, and filled the pockets and covered the gums with the solution. Upon removing the napkins and bibulous paper, the inflow of saliva forms a tannate of albumen, which seals and protects the pockets. The operation is repeated daily until a cure results.

R. B. ADAIR, Gainesville, Ga.

TO THE EDITOR OF THE DENTAL COSMOS:

DEAR SIR,—I have read with much interest the report of the meeting of the First District Dental Society of the State of New York, January 18, 1888, and remarked its general correctness. This faithful work was continued up to your last number—June. In this I find my remarks on Dr. Atkinson's paper on "Pyorrhea Alveolaris," while generally very correct, have been much mutilated. The secretary or the publication committee have for reasons best known to themselves taken the liberty to strike out a considerable, and, to my view, important part, not only making the connection absurd, but depriving the remarks of a fitting beginning. I wish, therefore, to protest against this mutilation, and to deny the right of any one to arrange any opinions of mine to suit themselves.

Yours truly,

JAMES TRUMAN.

PHILADELPHIA, June 8, 1888.

BIBLIOGRAPHICAL.

Das Fullen der Zahne bei intacter Pulpa. Mit besonderer Berücksichtigung der Verwendung von cohäsiver Goldfolie. Von Ludwig Warnekros, Zahnarzt in Berlin. Mit 150 in dem Text gedruckten Abbildungen, zum Theil mit Golddruck. Berlin, 1888. Verlag von C. Ash & Sons.

This is a thin book on the filling of teeth with unexposed pulps. It contains 108 pages and 150 illustrations. The author devotes eighteen pages to his "Introductory Remarks," in which he briefly disposes of the causes of caries, and materials for filling. In the latter the metals and plastics are treated so briefly that for all practical purposes they might have been left out entirely, inasmuch as the author seems to have had but one idea to illustrate. These are followed by "Drying of Cavities," in which he begins with napkins and the mode of applying them. The text here contains four illustrations very effective in showing the mode he adopted to keep the cavities dry by their use. It is very evident that, however skillful the author may be in other respects, the proper use of this most efficient aid in dental operations was not taught when he studied dentistry, for certainly no such mode would have been tolerated by the practitioners of this country before the introduction of the rubber-dam. This, however, is not a noticeable defect, for the proper use of napkins is, to the present generation of dentists, a lost art. The "Coffer-dam" is then considered without developing anything new. He devotes a page to the "Searching for Cavities."

The real subject of the book is then taken up—"Filling." The first chapter is devoted to cavities on the masticating surfaces of molars and bicuspids. He illustrates the text by the entire denture, natural size, with the ordinary cavities on the masticating surface, then the fissures as they are present in teeth, and then the instruments and mode of handling them. Then sections of the same teeth very much enlarged, showing the lines of displacement of tissue necessary in the preparation of the cavities. Then these cavities enormously enlarged are repeated. He begins his descriptions by briefly giving the process of filling with cement, then with amalgam, and finally with gold. He quotes from Prof. Paetsch, and describes his method as follows: "A sheet of gold, No. 4, is taken and laid in strips and then rolled together into cylinders of various sizes. A cylinder, without heating, is then taken and fastened in the corner of the posterior part of the cavity by a foot plugger and the aid of the mallet. Other retaining corners are prepared in other walls and they built up in a similar manner. The filling is completed with sheet gold No. 4 folded loosely together.

This method gives protection to the walls, permitting a strong blow of the hammer." His own method is then described, and is practically the same for all cases. The cavity is shaped with straight walls without undercuts. His first piece is anchored by cutting a "gutter" in the posterior wall extending from one side to the other. It should not be made deep, as it will affect the solidity of the wall. A cylinder of Wolrab's gold is taken and lightly warmed, and he then adds cylinder to cylinder with a hand plugger. Strips of No. 30 gold are then taken, slightly heated and packed against the Wolrab gold, first placed, by hand pressure and lead mallet. It will be seen that the operation, as a whole, is the one familiar to all cohesive-gold workers. The illustrations at this point, while not remarkable as artistic productions, are, perhaps, the most peculiar and certainly the most effective the writer has ever met with in a dental work. The point of gold in the retaining cavity is first illustrated, and the pellet represented in gold print. This is then followed with gold strips, one layer upon the other. Then another showing the completed filling in gold. In all eleven illustrations of masticating cavities are thus represented.

After a short description of the finishing process, he commences with "Fillings on the proximal surfaces of molars." These are profusely illustrated and the cavities clearly shown. His description of matrices exhibits a poverty of information as to modes in common use here to effect the same result. The cavities are represented as those first described, and treated in a similar manner. His favorite form of gold is from No. 30 to 40 cohesive; but he varies this in some cases, as in cavities on approximal surfaces of anterior teeth.

The thoroughness of his illustration is well represented on page 98, where a distal cavity of the first molar is reflected in a mouth mirror. This effort to make all the drawings as near as possible to the daily labor of the practitioner gives the work its greatest value. The beginner in filling teeth can see at a glance, even without sufficient knowledge to read the text, the recognized modes of performing such operations.

His mode of retaining the dam above the margin of labial cavities will not recommend itself to the average American operator. He inserts a small screw above the margin over which the dam is sprung. He says, "The subsequent filling of this small hole, made by the screw, does not present any difficulty, as it is quite small, not deeper than a millimeter, and the filling may be accomplished after the removal of the dam."

While the text of this work presents nothing new, the mode of treatment is decidedly unique and is worthy of special notice of

those contemplating practical works in any direction, but especially in that of operative dentistry. It covers but a portion of the processes of filling, and this constitutes its greatest weakness; but should the same mode of treatment be adopted comprising all forms of practice, the ideal work on operative dentistry will have been nearly reached. As it stands it is but a promise of the future. It would be indeed remarkable if the future best book on operative dentistry should come from Germany. It is to the disgrace of American dentistry, that while it has taught the world how to fill teeth it has not yet produced an effective book on that subject. J. T.

OBITUARY.

CHARLES M. MURPHY, D.D.S.

DIED, at Dover, N. H., April 30, 1888, after a lingering illness, CHARLES M. MURPHY, D.D.S., in the fifty-third year of his age.

Dr. Murphy was a man of considerable mark. He was born at Alton, N. H., November 3, 1835; was educated at the Academy at Norwich, Vt., and in 1858 went to Dover and commenced the study of dentistry with Dr. Jefferson Smith, beginning practice in 1861. His skill and affable manners soon made him prosperous in his profession. In 1870 he received the degree of D.D.S. from the Boston Dental College.

Dr. Murphy was quite prominent in politics, representing his ward in the city government in 1871–73; was a member of Governor Straw's staff with the title of colonel; was appointed consul to Moscow under President Hayes, but declined to accept; was a member of the Chicago Republican Convention of 1880; and was president of the Dover Five-Cent Savings Bank for several years. He was elected Mayor of Dover in 1880–81, and served with much success. He went to Boston in 1884, where he had since resided. During his career he made an ample fortune, but in late years met with severe reverses. He was twice married. His brother, Albert Warren, is the royal dentist at Madrid, Spain.

W. K. LINEAWEAVER, D.D.S.

DIED, at Pottsville, Pa., May 13, 1888, Dr. W. K. LINEAWEAVER.

Dr. Lineaweaver was a native of Lebanon, Pa. When the Rebellion broke out he entered the army as second lieutenant of Company F, Fourth Pennsylvania Cavalry, and soon afterwards became captain of his company. He served with his regiment in the various operations of the army from the Peninsula to the battle of Gettysburg. About 1864 ill health compelled him to seek a discharge.

After his release from the army Dr. Lineaweaver studied dentistry, graduating at the Pennsylvania College of Dental Surgery in the class of 1866. He located in Pottsville, where he established a successful dental practice, but relinquished it some years since to engage in coal mining and other business. He was of a genial, courteous disposition, was held in high respect as a citizen, and had the affectionate regard of his friends.

DR. J. F. MOULTON.

Died, at Stanstead, Province of Quebec, Canada, May 20, 1888, of heart-disease, Dr. J. F. Moulton, in the seventieth year of his age.

Dr. Moulton was born in Lyman, N. H., November 2, 1818. In 1847 he went to Stanstead, Quebec, where he lived and practiced dentistry for forty-one years, up to the time of his decease.

HINTS AND QUERIES.

Implantation Data Wanted.—Section VII—Physiology and Etiology—of the American Dental Association desires exact information in relation to dental implantation. Dentists who have performed this operation will confer a favor by sending to the chairman of the section, Dr. H. A. Smith, 128 Garfield Place, Cincinnati, Ohio, on or before August 1st, a report embracing the following points: 1st. What proportion of implantation cases in the writer's practice are deemed successful? 2d. If any have failed, what was the cause of the failure? 3d. Do implanted teeth resume their natural color? 4th. What is regarded as the mode of their attachment, if there be any? 5th. Remarks.

Crown Work.—Will Dr. H. A. Parr kindly explain how he solders crown-work immediately after investment, yet without cracking the teeth?—D. W. B., Brooklyn, N. Y.

To this query the following reply has been received: "I use my flux with the S. S. White Co.'s teeth, and not one in a hundred ever check when properly invested. I consider the fault of cracking due to the use of an impure flux and improper heating up."—H. A. Parr.

Impression Material.—In your condensation of my little suggestion in the June number of the Cosmos (Hint and Query Department) an error occurred which may as well be corrected. I was made to say, "The dough may be agreeably perfumed with a few drops of lycopodium." Substitute "any agreeable perfume" in place of lycopodium, and use the latter article to facilitate the withdrawing of the piece used as a pattern, and you will have what I intended to write.—H. P. Osborn.

Pyemia of Dental Origin.—The *Times*, of Cumberland, Md., reports the death of a young man from pyemia consequent upon an antral lesion, caused as is alleged by a diseased upper left first bicuspid. The family was unwilling that a post-mortem examination should be made, and hence reliable details of the case cannot be given.—A. B.

THE

DENTAL COSMOS.

Vol. XXX. PHILADELPHIA, AUGUST, 1888. No. 8.

ORIGINAL COMMUNICATIONS.

ETIOLOGY OF IRREGULARITIES OF THE JAWS AND TEETH.

BY EUGENE S. TALBOT, M.D., D.D.S., CHICAGO, ILL.

II.

(Read before the Indiana State Dental Society, June 26, 1888.)

Arrest of Development of the Maxillary Bones due to Race-Crossing, Climate, and Soil.

In a former paper I endeavored to describe the influences producing arrested development of the superior maxilla in its relation to idiocy, deafness, dumbness, and blindness. In this paper I shall try to explain other phenomena tending to cause arrest of development of the superior maxilla, and inharmonious growth of the maxillary bones.

The V, the partial V, and the saddle-shaped arches are to be found in the mouths of the strong-minded as well as in those of the idiotic, but not in so large a proportion. The same causes producing these abnormal conditions in the one case are also responsible for them in the other. It is a recorded fact that the early races possessed large jaws and regular teeth, and this fact has been verified by the examination of ancient skulls by Messrs. Cartwright and Coleman, and also by John R. Mummery, who has examined the skulls of three thousand modern uncivilized people between the years 1864 and 1870. Their conclusions were that irregularities of the teeth rarely, if ever, occurred among ancient races. More recent examinations by Dr. Nichols of the Chinese and Indians, during a stop of twelve years on the Pacific Coast and in the Rocky Mountains, show that irregularities do not prevail among members of the clannish tribes. Among the thousands of Chinese and Indians examined he failed to find a case of irregularity of the teeth.*

*Dr. Nichols doubtless refers to saddle and V-shaped jaws and protrusion of the upper and lower jaws.

In 1881 I examined the mouths of more than three hundred Chinese without finding a case of irregularity in the shape of the jaws and teeth. The jaws of the Chinese are broad across the bicuspid and molar regions, and the teeth are very irregular. The jaws of the African protrude anteriorly, and in this way the teeth find sufficient room. By examining the mouths of people living in new countries, where the population is made up of immigrants from every country, we shall find some deformities of the jaws and teeth, which will increase with the growth of the country.

With these facts before us, what conclusions can we draw? Every nation has its peculiar race of people; the older the nation the more clannish its people, the more fixed the type,—this type being molded after the peculiar characteristics and customs of the people, the climate and the topography of the country. The Chinese and Africans marry and intermarry among their own people, and the progeny are exact types of their ancestry for hundreds of years before; the race remaining excluded from others, and the habits and climate unchanged, so long will the characteristic type of a nation remain the same. The newer countries, as Germany, France, Norway, Sweden, each have their peculiar type of people. Each individual is stamped with characteristics proclaiming the country of his birth. The size and shape of the head and skeleton, the contour and mold of the body, the manners, and all characteristic qualities are transmitted from generation to generation. The jaws and teeth are alike included in the general transmission. But when members of the various nations emigrate and become citizens of a new country, the various influences surrounding them, of soil and climate and intermarriage, will produce in time a people as a whole totally lacking the distinctive features of any one race. America fitly expresses this condition: a land containing representatives of every country under the sun. The Indian and African, perhaps more than other nations, illustrate this fact. Their progeny, the result of a union of Indian or Negro with Americans, do not possess the distinguishing features characteristic of either of the races, but are recognized as half-breeds, octoroons, etc., no longer showing the perfectly symmetrical jaws and teeth of the Indian, or the protruding maxilla of the Negro, but a smaller jaw, with the face sunken at the alæ of the nose. It may require generations to stamp out completely the predominating features of a nation, but time has shown that a decidedly different tribe will result.

Irregularities of the jaws and teeth, says Mr. Cartwright, while uncommon among many, if not most, aboriginal peoples and tribes, and among the inhabitants of particular districts and locations, are common in most highly civilized communities, and especially so

in the upper and middle classes; and they are more constant among the inhabitants of towns than among the inhabitants of agricultural districts. He says further, that irregularity of the teeth "is the result of high and selected breeding." Obviously, however. the term "high and selective breeding" cannot be applied to man in the civilized state, except under special conditions, but only to savage men. These special conditions are the non-intermarriage in civilized countries of people of different races, which is the only form of selective breeding found among men. Irregularities of the jaws (and therefore of the teeth, for the latter are secondary) are extremely uncommon among aboriginal peoples and tribes,—aborigines generally,—and are uncommon among the races that retain their racial blood. Among the Irish and Scotch, in their native lands, irregularities are not common, and it is at least a very striking coincidence that these people, in their own countries, do not often intermarry with other races, excepting the higher classes, in which the great majority of the irregularities are found.

Further, in regard to the theory of "high and selective breeding," we find irregularities in every walk of life, from the idiot and the poor to the intellectual and the rich. The lower classes of our foreign population do not include so large a percentage of irregularly shaped jaws and teeth as the same class of Americans,—the latter being composed of the offspring of mixed nationalities. The same reason holds good for the population of the new and old settled parts of the same country. In a collection made by Dr. Shepard, of Boston, may be seen twenty-six V-, partial V-, and saddle-shaped arches out of one hundred and sixteen models,—a much larger percentage of constitutional deformities than could be shown in any equal number of models of mouths in a newly-settled district.

"The laws of inheritance," says Kingsley, "confirmed by common observation, show how constant is the mingling in the offspring of the traits of character and the peculiar features of two diverse races brought together in marriage. This mixture, without blending or harmonizing, is productive of deformity in character and physique. Thus, so far as the jaws and teeth are concerned, they may exist in each parent in perfect symmetry: in one parent the jaws and teeth are large, in the other parent both jaws and teeth are small; but each in its way is a normal development. If now the small jaw of one parent and the large teeth of the other appear in the offspring, deformity is sure to follow." Benedict declares* that abnormality of structure predisposes to disease, and among abnormalities of structure he mentions particularly pathological length and breadth

* Kraniometrie und Kephalometrie. Wien, 1888.

of the face, pathological relation of the sutures, asymmetry, and intercalaria.

The most convincing proof that abnormalities of the jaws are mostly due to race-mixture is the fact that these abnormalities are not found in a pure race, *e.g.*, the Chinese and Negro races. By examining the figures of the dolichocephalous (Fig. 1), Sarmatic brachycephalous (Fig. 2), and the Turanic or extreme brachycephalous (Fig. 3) types, it will be seen at a glance how entirely different must be the single measurements, not only of the skull generally, but of the face, and particularly the superior maxillary bones. These types represent to a greater or less degree the German, Slave, and Finno-Magyar skulls of the present day, though it is probable that the differences are not so sharply drawn in living specimens.

Anthropologists agree that racial differences and peculiarities are shown more clearly by the skull as a whole than by any other

FIG. 1.

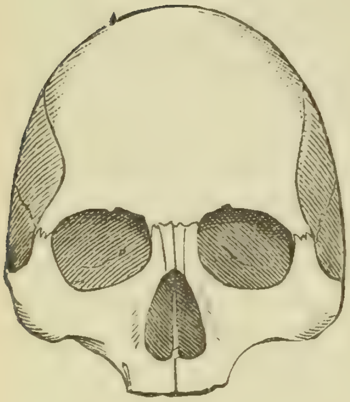


FIG. 2.

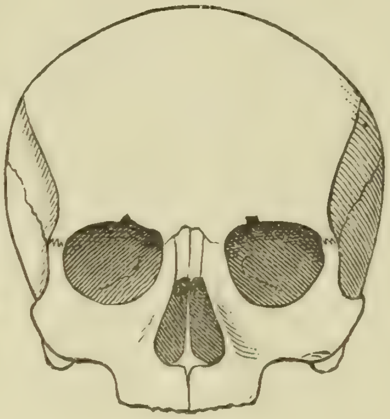
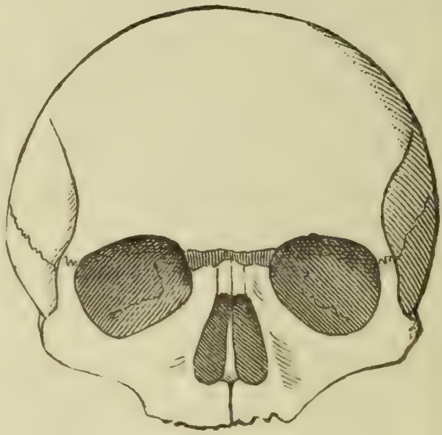


FIG 3.



portion of the skeleton. It is to be supposed, then, that in a mixture of two races with important cranial differences, an attempt by nature to mix the types, without the ability to blend them harmoniously, must result in an irregularity or abnormality. This argument is borne out in almost every respect by the sexual mixtures of plants and of the lower animals. In the case of plants the abnormalities are shown in color, form, and structure: in the case of edible plants by form and structure chiefly, as for example the fertilization of the watermelon bloom by the pollen of the cucumber flower; in the case of animals by variations in form and structure and temperament; and in man on account of the predominance of the cerebral and nervous functions, and of the chief individual differences being found in the face, in variations as to form, to a certain extent, temperament, and cranial structure. It is simply a matter of evolution—of change and reformation of type. But in

civilized communities the law of survival of the fittest is practically annulled.

Let us suppose, for example, that a person with the form of cranium shown in Fig. 1 be married to one with the form seen in Fig. 3. It seems scarcely possible that there could be a perfectly harmonious blending of the cranial differences in these types, even if both parents were in perfect health, and the offspring remain in perfect health throughout infancy—which may be said never to obtain in civilized communities. And what must be the result if nature attempt to combine what may be called the intellectual cranium of Fig. 1 with the animal strength of face and jaws of Fig. 3? Clearly, deformity, or at the least irregularity. Nature could never fit the superior maxilla of Fig. 3 into the face of Fig. 1. There is no incongruity involved in believing that she would attempt this; the law of inheritance—call it nature or what else—that insists upon perpetuating supernumerary digits and the like, would not stop at harmless peculiarities, as is shown by the distinct inheritance of disease, such as cancer, tuberculosis, heart-disease, etc. Nor is it too much to assert that neuroses, which are distinctly hereditable, are in a large measure due to abnormalities in the conformation of the cranium. In a former paper I clearly demonstrated the fact that the shape and size of the superior maxilla depend to a great extent upon the shape and size of the cranium.

In investigating the causes giving rise to racial characteristic features and to individual deformities, we may gain much valuable information from the actions of the conditions of life, and the evolution of man from the embryonal to the adult state furnishes most interesting facts. "Simple arrest, a slight excess in the evolutive phenomena," says Quatrefages, "are, it appears to me, the cause of the principal differences which separate, and particularly the two extremes, the negro and the white." We need not fall back upon a theory of reversion of type. The human fetus furnishes all the elements of a human evolution theory.

Few will deny that what is true of the whole organism is equally true of its different parts, organs, functions, and energies; and that in the formation of a new being the action of heredity is divided into as many cases as there are characters to be transmitted. There is a tendency on the part of each parent to reproduce itself in the child, and consequently there is a constant struggle between the two natures in the morphological growth of the child. The more dissimilar the parents the greater the struggle, and the more certain the predominance of leading characteristics, and the greater the tendency to morphological abnormalities—arrest or excess. The outcome of this struggle, assuming inequality of action on account

of one parent being stronger, is a number of single combats in which one or the other of the parents is vanquished.

In crossing between different races, says Quatrefages, the half-breeds possess the characters that in each of them predominate over the corresponding characters of the other.*

While the general relations of length and breadth in the crania of human races are apparent from birth, the studies of Gratiolet go to show that dolichocephaly is due to a relative development of bones, which varies with age. In the infant it is essentially occipital, in the child temporal, and in the adult man frontal. Unfortunately, in this respect anthropologists have studied the bones of the face less closely than those of the skull. In a general way faces may be divided into euryopsal and dolichopsal (broad and long). For reasons that are apparent, the inferior limit of the face should be the alveolar border of the superior maxilla, middle line, while the upper limit is the point sus-nasal,—the fronto-nasal suture. The line connecting these points is always less than the bizygomatic breadth. The product of the length of the face multiplied by 100 and divided by the breadth is known as the facial index. Broca showed that this index is greatest in the embryo, less in a perfect fetus, and constantly diminishes as the body approaches its final and definite state; and from this he concludes that the variations seen in the same race may be often referred to an arrest of development, or rather to an arrest of evolution. Quatrefages regards this as a very correct explanation of one of the distinctive features that most clearly distinguishes the black race. It is to be remarked that in all races the nasal and orbital indices of the woman are greater than those of the man, and consequently the woman thus preserves a certain infantile character.

Now, we know that it is the superior maxillary prognathism of the negro that so clearly distinguishes the negro's face from the orthognathous face of the white; and this variety of prognathism arises from that portion of the superior maxillary bone situated below the nose, and comprising the alveoli of the incisors and cuspids. But the degree of prognathism in the individuals of any one race is not constant; there are oscillations of characters that are everywhere met with in races not subject to selection with any special aim. The prognathism of the negro is evidently an excess of development, since it increases with the age of the individual.

More or less essential characters are found in the zygomatic arches, the malar bones, and the superior and inferior maxillæ; and in refer-

* It must be remembered that every mixed race, when uniform and settled, has been able to play the part of a primary race in fresh crossings.

ence to a given race, Quatrefages asserts that they acquire a value superior to that which they have elsewhere. Such is the slight elevation of the palatine vault in the Lapps.

The existence of a cessation of evolution is again proved by the parietal angle, which may be negative in the adult, and is then nothing more or less than a persistent fetal or infantile characteristic; for this angle is negative in the fetus and infant in all races.

Climate and soil.—There are certain characteristics, long supposed to be purely racial, that are now definitely known to depend upon climate and soil, particularly the former. Such are the statopygia of the Bojesman and Houzouana races, which were thought to be peculiar to these races until certain women of the Boers, of undoubted Dutch descent, were affected by them. On the other hand, the fat-tailed sheep of central Asia lost the appendages when the Russians removed them from their native country.

Climate and soil and the conditions of life may modify the bony parts to an important extent. Blumenbach showed that there is more difference between the head of the domestic pig and that of the wild boar than between those of the white and negro races. In this connection we are at once reminded of the marked difference between the heads and the skeletons of the bulldog, greyhound, and spaniel, for example. The *niata* cattle of Buenos Ayres and La Plata exhibit characteristics of their own, and not unlike those distinguishing the bull-dog from other dogs. "All the forms are shortened and thickened, the head in particular seeming to have experienced a general movement of concentration. The inferior maxillary bone, although itself shortened, so far exceeds the superior in length that the animal is unable to browse the trees. The cranium is as much deformed as the face; not only are the forms of the bones modified, but also their relations, not one of which, according to Professor Owen, has been strictly observed." This is a perfectly established race, but it, as are all American cattle, is descended from European stock. The wool of sheep is modified to a marked extent by change of climate and soil; and an expert wool man in Chicago asserts that he can tell by the feel of the wool from what part of the country and particular State it has come.

The effect of change of climate is seen also in fruits of the soil taken from one climate to another. This was first seen in the case of the peach, and later in the cases of wheat and tobacco. Tobacco-seed brought from North Carolina to Wisconsin and planted soon produces an entirely different looking plant and different grade of the tobacco from the parent stock—different in color and properties.

Climate cannot cause these changes alone, however; in the case of plants it is undoubtedly a large factor,—perhaps larger than in the

cases of the lower animals and men. The structure, appearance, color, and other peculiarities of plants are influenced by soil, from which they obtain their food directly, and by breeding. The effect of close breeding upon plants and fruits, the difference in the results when plants are propagated by seeds or by buds and shoots or slips, are too well known to require discussion or extended mention.

In the case of the difference in the texture of the wool of sheep grazed in different localities, it seems that, even with the same family of sheep, food must play as large a part in giving the peculiar texture to the wool as climate. In the case of horses of La Camargue, sheltering and careful feeding of the mares have the effect of raising the height of this breed of horses. As regards the human family, Durand (de Gros), in confirmation of an observation made by Lartet, showed that in the Aveyron the populations of the limestone cantons are sensibly taller than those of the granite or schistose cantons; and Dr. Albespy stated that liming lands in the non-calcareous portions of this district has raised the height by two, three, or even four cm. on the lands where this practice has existed for the longest time (Quatrefages). This same effect of liming lands, I am told by an army officer born in Maryland, was observed in one of the districts of Maryland some years ago.

That changes of climate and soil do modify races to an important extent is shown by the Anglo-American, the Yankee, who no longer resembles his ancestors. Andrew Murray, in endeavoring to account for the formation of animal races, said that he could not do better than appeal to the condition of mankind in the United States. At the second generation of the English Creole in America, says Quatrefages, his features present alterations that approximate him to the native races. In the face the temporal fossæ are pronounced, the cheek-bones become prominent, the orbital cavities become hollow, and the lower jaw massive. The negro has undergone remarkable changes since being brought into the United States, the most remarkable being that his physiognomy has altered. "In the space of one hundred and fifty years," says Reclus, "they have passed a good fourth of the distance that separates them from the whites, so far as external appearance goes." "We shall have to recognize," says Quatrefages, "that in the United States a sub-negro race has been formed, derived from the important race."

In this connection it is a curious and interesting fact that the teeth of Scandinavians decay almost immediately after arrival in this country, and this is doubtless due to change of climate, soil, and food. Every race being a resultant whose components are partly the species itself, partly the sum of the modifying agencies that have produced the deviation from the type, nothing is more in accordance

with natural laws than that still further modifying causes, differing from any that a race has known before, should modify types to a very marked degree. The race will retain some of the former characteristics, but it will at the same time acquire new characteristics. Conditions of life and heredity, then, are both modifying agents and agents of stabilization, and in either case, says Quatrefages, their result is to harmonize organisms with the conditions of their existence; and heredity, which is essentially a preserving agent, becomes an agent of variation when it transmits and accumulates the modifying actions of the conditions of life.

From the foregoing it seems legitimate to draw the following conclusions:

1. The same influence which produces the small jaw in the idiot, deaf and dumb, and blind will also produce the small jaw in strong-minded individuals.

2. Heredity and conditions of life can give rise to a variety, and as the individual that has begun to deviate from the type becomes in its turn apparent, tending to transmit to its offspring the exceptional characters that distinguish it, the variations become more marked in the offspring, and heredity transmits the sum of these variations to the following generation.

3. Irregularities of the jaws and teeth are not found in pure races nor in aborigines.

4. Irregularities of the jaws and teeth are common in mixed races, and more common in the offspring of races differing widely from each other.

5. Such irregularities are not the result of high and selective breeding, since such breeding obtains only in pure races and aborigines, in which the irregularities are not found.

6. Conditions of life, climate, soil and food play an important part in irregularities of the jaws and teeth, when taken in connection with race-mixture.

7. In the older parts of new countries in which a number of generations have lived, small jaws and irregularities of the teeth are more numerous than in the newer parts of new countries.

8. The shape as well as the size of the head has much to do with the shape of the jaw.

9. The prognathism of the jaw increases with the age of the individual. It is, however, sometimes a natural growth, as noticed in the negro, and is characteristic of that race. In the American race it is mostly due to local causes.

DENTAL INLAYING WITH PORCELAIN.

BY W. STORER HOW, D.D.S., PHILADELPHIA, PA.

THE repairing of carious teeth by inlaying them with corresponding pieces of porcelain was first suggested by Dr. B. Wood, in the DENTAL COSMOS of December, 1862. Subsequently, Dr. Geo. T. Moffatt, DENTAL COSMOS of July, 1869; Dr. C. J. Essig, DENTAL COSMOS of May, 1871; Dr. M. H. Webb, DENTAL COSMOS of November, 1872, June, 1873, November and December, 1879, and also in May, 1882 (giving credit to Dr. F. Hickman as of the date of 1870); Dr. C. H. Mack's patent of 1873; Dr. S. D. Rambo, DENTAL COSMOS of April, 1882; Dr. C. H. Land's patent, December, 1887, and Dr. A. H. Thompson, *Western Dental Journal* of May, 1888, all set forth various ways and means by which dental inlaying and partial restoration with pieces of porcelain had been and might be accomplished.

One of the chief obstacles to success in many of these operations has been the difficulty of exactly fitting the inlay to the tooth. There is, however, a class of cases which, by methods that will be now described, may be repaired with the certainty of gratifying results.

A typical instance is that illustrated in Fig. 1, and the filling of gold usually inserted in such a cavity is a glaring disfigurement, endurable only by reason of the necessity of preserving the life and usefulness of the tooth. Fig. 1 also shows the oval shaped cavity about to be converted into a circular one by means of a wheel bur, as, say, No. 208. A fine-cut bur is essential for this work, which requires skill and delicacy with firmness of touch in order to the making of a truly circular cavity of the smallest diameter consistent with the inclusion of all the borders of the original cavity. When this has been nearly done, and the cavity suitably deepened by an excavating wheel bur, as No. 22, the barrel bur, say No. 239, is to be used with steadiness and due attention to the holding of it, so that when pressed quite to the bottom of the cavity the margin will be exactly circular, whenever that is possible. (See Fig. 2.) In some cases the differences between the diameters of the successive or even the same numbers of the finishing burs will be found too great, so that while one size is not quite large enough, the next size is much too large. It is best therefore to be prepared with some hard-wood points, in shape like the wood polishing-point No. 3, and of closely graded sizes to be used in the porte-polisher No. 307. A thin strip of bone or ebony or vulcanite should also be at hand having a series of holes that may be made with the barrel burs, each of which will make three different sizes, and the strip

serve as a very useful gauge. Selecting then a hard-wood point (one made of copper, or of tin solder, would be even better) a very little larger than the cavity, put in it some corundum polishing-paste and carefully grind the cavity larger, circular, and true down to the bottom. Of course it is next to be thoroughly washed out with alcohol and dried with warm air. With a wheel bur No. 15, or oval No. 91, cut small grooves in the upper and lower walls, but not on the thin side-walls, which would thus be needlessly weakened. Select from the stock of broken or whole porcelain teeth, whether plain-plate, vulcanite, or gum teeth, one which will match the color of the natural tooth, and, with a corundum disk or other wheel, cut out a section somewhat larger than the cavity. But when a stock of cavity-stoppers is accessible, one of these will be preferable because made wholly of enamel, and therefore likely to take a better polish in the process of finishing.

It is worth while to spare no trouble or time or expense in matching as nearly as possible the exact shade of the tooth to be inlaid,

FIG. 1.

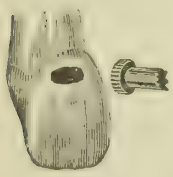


FIG. 2.

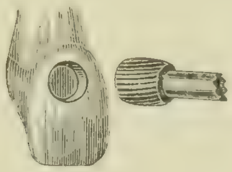
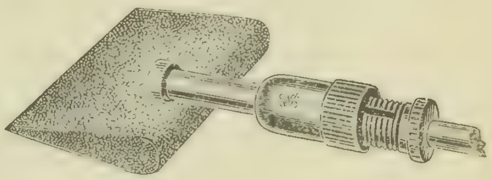


FIG. 3.



because the success of the substitution will greatly depend upon the closeness of its resemblance to the natural tooth. In an emergency. choose the lighter rather than the darker shade. When the suitable tooth has been found, and ground to an approximate diameter and thickness, cleanse thoroughly its enamel face with alcohol, and then, with shellac melted but not burned, stick the face of the porcelain to the flat-faced end of a wood point in the porte-polisher. After the porcelain has become quite cool, try it severely to be sure that it is stuck fast, because it will be annoying and cost valuable time if it shall be dislodged and need to be re-set when nearly finished. For the purpose of illustration, a cavity-stopper is selected, and is shown mounted with shellac on a wood point. The porte-polisher is put in the engine hand-piece and rotated in contact with a corundum wheel, or slab, Fig. 3. For more rapid grinding it may be rotated in contact with a revolving corundum wheel. The gauge previously mentioned will serve for frequent trials in the successive holes until the inlay fits the hole next larger than the cavity. Then the successive trials must be made in the cavity itself until, after grinding on a piece of Arkansas stone, the inlay exactly fits the cavity. In some instances it will be best to wet the inlay with a very fine polishing-paste and

grind it in the cavity. This is, however, somewhat hazardous, because of the liability of the inlay to get stuck fast in the cavity, and so endanger the cavity-walls. It is then best to grind on the corundum slab the bottom of the inlay, to allow it to settle in the cavity and take up the space previously occupied by the paste between it and the cavity-walls. A fitted inlay will resemble Fig. 4, and for greater security after it shall have been mounted it will be necessary to cut with a sharp corundum disk notches on opposite sides of the inlay; and to insure the coaptation of these notches with the grooves in the cavity, and at the same time be sure that the inlay shall shade properly with the tooth, it will be best to detach the inlay from the wood before cutting the notches (Fig. 5). Both the cavity and inlay must be perfectly clean and dry before the inlay is lightly placed in the cavity, to determine which is its upper and which its under edge, so that the notches may be correspondingly cut with a clean, sharp, dry disk. Another reason for so cutting the notches is found in the fact that sometimes the lateral curve of the surface of the tooth will be so great that a groove on the lateral wall of the inlay would jeopardize the closeness of the joint on the surface at that point.

It will of course be understood that the process described with reference to the porcelain cavity-stopper is applicable to the preparation of any section from a porcelain tooth, and at this stage of the proceedings it is assumed that the clean, dry, notched porcelain inlay closely fits the clean, dry, grooved cavity. These are to be fastened to each other mainly by a locking bit of cement or gutta-percha in each of the notches and grooves, in addition to a mere film of such plastic material between the cavity and inlay walls. This is the critical period of the operation, because of the extreme difficulty of so nicely proportioning and evenly distributing the cement or gutta-percha that the joining of inlay and tooth shall be complete in the actual contact of the marginal walls, excepting only the interstitial porosities which are to be filled with the cement or gutta-percha.

It is probable that the generality of operators will do best with the phosphate of zinc cement, but in any case, whatever the material of union is to be, the invariable pre-requisites are,—perfect dryness of both the cavity and the inlay, and some degree of warmth in each of them. These conditions may be best accomplished by a thorough washing of both with absolute alcohol, and the use of the hot-air syringe immediately preceding the mixing of the cement. This should be mixed quickly and thin, and a mustard-seed bit of it taken on the blade of a small excavator and placed in the two grooves of the cavity, as also in the two grooves of the inlay; to be

instantly followed by the rubbing of the walls of the inlay all over with the least possible cement on the tip of the finger. The inlay is then at once seated in the cavity and with a quick back-and-forth grinding motion pressed firmly into place (taking care that the notches are in right relations to the cavity-grooves), and held under pressure for fully five minutes. In cases wherein the inlay has been ground into the cavity, it may be better not to remove the inlay from the mandrel, but to thinly coat its walls with cement, and, using the porte-polisher as a handle, turn the inlay into its seat (as a ground stopper into its bottle) with such firmness as to detach the inlay from its shellac attachment to the wood point, and leave the inlay stuck fast in the tooth. A little white wax is then melted around the joint with a hot burnisher, and the patient dismissed for a subsequent sitting, at least five or six hours later; for it is of great importance that the cement be allowed to get hard before any strain is put upon the inlay. It is also essential to the proper seating of the inlay that no cement be allowed on the floor of the cavity or the bottom of the inlay, because no amount of pressure will bring

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 7.

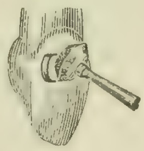


FIG. 8.

the walls into contact if there is a body of cement between those two flat surfaces; and continued pressure for a short time after the seating is necessary lest the elasticity of possibly occluded air lift the inlay from its seat before the cement or gutta-percha shall have stiffened sufficiently to hold it in place.

The rough grinding of the protruding portion of the inlay (Fig. 6) may be done with a stump or crown corundum wheel, until the margins are nearly flush with the tooth surface, and then a beveled corundum point like No. 7 or No. 12 may be used, as shown in Fig. 7, to make the inlay conform closely to the contour of the tooth, and the final finish will best be given by an engine Arkansas stone beveled like "R" or "T" and used with its further side in contact with the inlay, or tooth, or both as the case may be (Fig. 7). Such use of the side of a grinding or polishing wheel avoids the hollowing or wavy lines which commonly result from the peripheral contact of wheels or points with the convex surfaces of the tooth. Indeed, the preferable polishing instrument would be a device like the old engine reciprocating porte-polisher, if it could be given power enough to be effective. A magnifying-glass will aid in making sure that the finish leaves the inlay border quite flush with the enamel at every point.

A small beveled Arkansas stone wheel is almost a necessity for making the inlay flush with the enamel, because the hard stone not only cuts the porcelain smoothly without acting also upon the enamel by its detritus as is the case with the soft stones when the enamel and inlay surfaces are nearly in the same plane, but it has a peculiar feel under the hand when cutting the porcelain, and also emits a peculiar sound so that although the water and débris may hide the joint from view, the operator can know by the touch when the wheel is acting upon the inlay or the tooth. This is of great consequence in order that only so much, and yet every whit of so much porcelain may be cut away as shall suffice to make the best possible joining, while preserving all the enamel essential to a flush contact with the inlay and a suitable contour of both at the finish.

Previous to attempting this method of repair, it is advisable that there should be some preliminary practice in setting inlays in teeth which have been extracted, or in pieces of ivory or bone; because there will thus be developed practical points which cannot be here

FIG. 9.

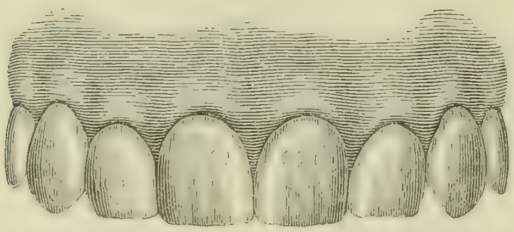


FIG. 10.

described and yet are essential to the proper performance of the operation.

The completed inlay, Fig. 8, when suitably adapted and finely finished, may well be considered as exemplifying the nearest approach to perfection in the accomplishment of dental repair that has as yet been achieved.

Dr. William Sachs, of Breslau, Germany, suggests the employment of a series of drills cutting only on their ends like the flat-ended safe-side burs, and made of standard sizes to correspond with porcelain enamel cylinders of the same diameters and, say, half an inch in length. These he would have grooved every eighth of an inch, so that a section might be readily broken off when desired for use. It is to be said, however, that while the drills might be made in exact sizes, the enamel cylinders would necessarily be inexact by reason of fluctuations in degrees of shrinkage during the process of baking them, and thus the cylinders would seldom or never precisely fit the cavities made by the drills. Such cylinders would furthermore fail to afford facilities for matching the teeth by reason of the lack of a polished end surface for comparison with the shades of the natural teeth. In view, therefore, of all the circumstances and con-

ditions to be met, it is deemed best to attempt the supply of a series of truncated cone-shaped cavity-stoppers or inlays, of from about a tenth of an inch to a quarter of an inch in diameter, and a fifteenth of an inch in thickness. These will, it is thought, meet all ordinary indications for this class of operations.

Oral teeth are occasionally seen having small pits in their labial surfaces, and in such cases the small inlays will prove in every respect preferable to metallic or plastic fillings. Fig. 9 illustrates the repair of such teeth with small porcelain inlays.

Some teeth of the class shown by Fig. 1 may sometimes be restored with dual inlays, as illustrated in Fig. 10. In such a case the unoccupied gingival part of the cavity could be filled with gutta-percha, or even with gold, without producing a very conspicuous result. Or, the circular inlays may be fitted separately and then be jointed at the mesial edges so that the bordering interspaces or *septa* will be so small as to be nearly unnoticeable.

The foregoing descriptions and illustrations will, it is confidently hoped, make clear and plain a practical process for the positive promotion of professional progress towards excellence in dental art.

When circumstances admit of the grinding of the inlay within the cavity in the process of a final fitting, the adaptation should be so close that a solution of gutta-percha in chloroform or some thin fir-balsam will serve to unite the two with a film so thin that when both surfaces are at last properly polished the joint will be but a line. The importance of great care in so preparing the cavity that its margins shall be both sharp and smooth becomes evident when the polishing of the inlay and tooth-surfaces approaches completion; for then every little defect in the enamel edge is made apparent, and can be effaced only by slow skillful attrition so directed that both the inlay and the enamel surfaces shall receive corresponding convexity.

The error to be constantly guarded against is the grinding of plain or concave surfaces at the junctions, and hence much patience and good judgment are requisite for the purpose of producing the finest attainable result in the concluding steps of the operation.

This is but another of the innumerable instances in which materials and methods may be most admirably adapted to the desired end, yet none the less essential will be the observant eye, the reflective mind, the correspondent reason and the trained hand for the accomplishment of perfectly simulative repairs in any part of the human body.

THE PHYSICAL PROPERTIES OF VULCANITE.

BY THEODORE F. CHUPEIN, D.D.S., PHILADELPHIA, PA.

A SERIES of very sensible articles appeared last year under the above caption from the pen of Dr. George B. Snow, of Buffalo, N. Y., in the *Dental Advertiser*.

The writer, after giving many good points and making many valuable suggestions about vulcanite work and the behavior of vulcanite dental plates, recommends that when, from the nature of the case, it is found impracticable to make the plate of equal thickness, the places where the plate will be unduly thick be filled with small pieces of rubber which has been already vulcanized (an old rubber plate, for example, cut up and cleanly filed into small pieces about the size of duck-shot), to compensate for the undue thickness of the plate at these points, and to control the expansion or contraction of the material.

If a set of teeth be waxed up and flasked in the usual way, it will be extremely difficult to know where to place these pieces of vulcanized rubber; the memory being the only guide as to where they are to be put, the procedure is reduced to guess-work.

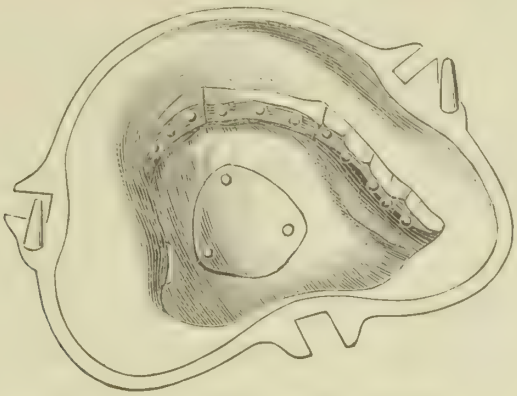
To overcome this difficulty (recognizing the value of the suggestion) we proceed as follows: After the case has been waxed up as usual, whether gum section or plain teeth are used, the wax is carefully removed from the front part of the sections, or from the front part of the plain teeth, so that these are held in place only by the wax on the palatal surface. Those parts of the sections, or plain teeth, and the plaster model are then painted with rubber solution (red rubber dissolved in chloroform), and when this dries, small pieces of red rubber are packed next the sections to form the rim; or small pieces of pink rubber are packed next the plain teeth to form an imitation of the gum. This being done, the case is flasked so that the plaster of investment is brought all over the front part of the teeth as shown in the figure. Thus the small pieces of vulcanized rubber may be placed just where they are needed to compensate for the extra thickness or volume of rubber at these points.

The illustration indicates the extent of such extra thickness under the biscupids and molars, for which spaces the vulcanized pieces are to be prepared in the present instance.

Incidentally it may be observed that by this mode of flasking the teeth are kept in their exact positions relatively to the cast, and, the gates being freely cut in the other part of the flask, the articulation will be found undisturbed even though the flask should not have been accurately and completely closed.

It is well to say that in removing the wax from the front part of

the case, this should be all removed before the case is painted with rubber solution, and the small pieces of red or pink vulcanite that are put in place of the wax that was removed should be added to the painted surface with a clean wax spatula, free from all grease,



wax, or dirt, and heated (for easier manipulation of these pieces) in the blaze of a spirit-lamp. If there is any grease on the spatula the rubber will not stick to the places where it is wanted.

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting, Wednesday evening, May 16, 1888, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street.

The president, Dr. J. Morgan Howe, in the chair.

Incidents of Office Practice.

Dr. William Jarvie. I would like to speak of a case that came to my notice recently and which belongs to a class of cases concerning which there is great difference of opinion. A boy ten years of age had broken a superior central incisor, leaving perhaps one-third of the crown. The temporary cuspids were in, but the first bicuspids had erupted. What is the best practice in such cases, where all the indications are that the jaw is inclined to be narrow and the arch crowded with teeth? Is it best to extract what is left of such a tooth, and allow the space to close up as the permanent teeth erupt, as it would naturally do under the circumstances? At the best, the child has met with a misfortune. A porcelain crown might last some years and it might not. Wearing a plate would be a great discomfort. Would not the slight disfigurement in the front of a man's mouth, caused by the loss of an incisor early in life, with the space filled by the other teeth, be less of a misfortune than the

discomfort and annoyance of having to wear a plate throughout life, together with the injurious effect of such an appliance upon the other teeth and the soft tissues? For a similar case two years ago I advised the extraction of the broken tooth. The boy's mother was desirous of doing what was best for the child, and was fully alive to the importance of procuring the best advice. She came to New York and visited at least four dentists in this city, all of them of good repute and men whose judgment I think we would all value. Their judgment varied greatly; only one of the four agreeing with me in advising the extraction of the tooth. The lady came again to see me a year ago, one year after her first visit, and nothing had then been done. She then told me whom she had consulted and the different advice she had received, saying that in the multitude of opinions she feared to do anything, because whatever she did would be against the advice of some dentist of repute; so she had done nothing. She came to me again recently and asked my advice. I told her the conditions had changed, and while my first opinion was perfectly good when given, I did not know whether I would give the same advice now, and under the circumstances I would prefer not to give any whatever. I told her to select some one dentist in whose judgment she had confidence and do whatever he advised concerning the loss of the tooth or its retention, and not waver any longer, because two very important years had already been lost.

I have had several such cases, and I know the judgment of dentists differs very widely regarding the proper treatment.

The President. Can Dr. Jarvie tell whether the pulp of this tooth was destroyed?

Dr. Jarvie. The pulp at the time I first saw it was not dead, though the tooth was broken off so near to the pulp that the pulsations of that organ could be seen through the thin film of dentine over it. I capped it with oxyphosphate, which remained in place until the following summer, I think. The boy was in the woods somewhere and the oxyphosphate either wore away or came off, and he went to some dentist in a village near where he was, whose treatment resulted in the death of the pulp. At the time I gave the advice to have the tooth out the pulp was still alive, and I think that under careful treatment it would have continued alive.

The President. This is a very interesting case.

Dr. Jarvie. It is only one of a class of cases, and I would like the opinions of some of the gentlemen in regard to it.

Dr. W. H. Dwinelle. Dr. Jarvie says that when the tooth first came to him the pulp was alive, although there was but a thin covering of dentine over it. If that vitality could have been pre-

served until the pulp, whose office it is to protect itself with a deposit of secondary dentine, had fulfilled that function, it might have wrought the best result; as the root at that early age could not be perfectly formed, and this treatment would give it an opportunity to become so. I would advise under those circumstances the use of two small screws, which could be inserted in dentine, one on either side of the pulp, without interfering with its vitality; or a groove could be cut about it so that the tooth would be like an inverted cone, and a porcelain cap and corner then placed upon it, which might last a long time.

Dr. Jarvie. Would Dr. Dwinelle advise retaining a tooth in such circumstances, the tooth being badly broken and having a live pulp?

Dr. Dwinelle. I would experiment with it and try to restore it.

The President. Would Dr. Jarvie have advised differently in the case of a girl with such a broken tooth?

Dr. Jarvie. My advice sometimes would be different for a girl from what it would be if the patient were a boy. I will relate the effect of such treatment in a case, the patient being a girl. She was about nine years of age at the time, and while playing in the street ran against a cart and knocked out one of the superior centrals. They sent for a physician, who treated the wound, and afterwards brought her to me. But in the mean time the tooth was lost and the socket partly filled up. In that case I did nothing. I advised letting the teeth come slowly and gradually together. The child has become a young lady of perhaps nineteen years, and there is now very little disfigurement. I know that other dentists at the time gave very different advice: they thought it would have been better to have put in a plate; and the parents were rather anxious to have a tooth put in and have her wear a plate. I thought differently, and I think the result proves that I was right.

Dr. Perry. At the age of the patient mentioned by Dr. Jarvie the root could not have been perfectly formed, and as it would not be of as much importance for a boy as it would be for a girl, it would seem to me to be the best practice to take it out. I have patients who have lost centrals or laterals, and the loss is hardly perceptible. I have in mind a young woman, not a patient, who has elegant-looking teeth, and I knew her years before I discovered she had lost one of her laterals. But after all I do not think any of us can give very intelligent advice in reference to such cases unless they are before us so that the conditions can be clearly seen. It is very difficult to give trustworthy opinions in such cases unless we can see each patient. Dr. Jarvie said the teeth were rather crowded. If the case were that of a young lady, or even of a young man, where it was desirable to keep the articulation and the position of

the teeth intact, I should say "save the tooth;" put on one of Dr. Littig's tips, let it stand as many years as it will in that way, and then, if you have to, cut down to the gum, put on a crown and let that stand as long as it will. By the time the young man gets to middle or old age, if anything goes wrong with the root he may, perhaps, have a new tooth put in, for we may know more about implantation then than we do now. If it is a girl we should go considerably further in trying to save the root than with a boy.

Dr. O. E. Hill. A gentleman has kindly accompanied me this evening, and will allow you to examine his teeth, the peculiar characteristics of which are briefly as follows: the right upper central incisor, when I saw it about six months ago, was more elongated than it is at present; there was a free discharge of pus, and it had been in the same condition for six weeks or more. I questioned the patient very closely in regard to pugilistic encounters, but he assured me he never had had any, so this is not the result of anything of that kind. I can detect no cause except that he bites very high, the lower teeth biting clear to the upper gums. But why that should have caused the loosening of the teeth and this result, I do not understand. There is no question that the anterior process is gone from off the right central, and now the left central and lateral are also being affected. They are both very sore and pus is discharging around them. When I saw the case originally these teeth were not involved, and to be sure that the pulp of the right central was not dead I drilled into the tooth until I was certain it was alive. There is no question but it was alive at that time, and I believe it is alive to-day. The patient is a healthy man, who works every day. To me it is a very interesting case. I never saw one before just like it, and do not know that I ever heard of one. If any gentleman has a theory in regard to the cause of this condition other than the continual outward pressure of the lower incisors against the upper ones, I would like to have him state it.

Dr. Jackson. Was there any deposit upon the teeth?

Dr. Hill. Not that I could discover.

Dr. Jarvie. It would seem to me, from a superficial examination, that the lower teeth, striking against these teeth and the gum, might produce this condition, but I think it would be very unwise for any one to say positively that such occlusion was the cause of the present condition. Sometimes things that are apparently trivial produce very serious results. Some years ago a patient came to me suffering very severely with a left upper central incisor, a perfectly sound tooth apparently. There had been a very small approximal filling put into it some years before, which was still perfect. The gum was somewhat swollen, there was considerable inflammation, and

the patient was suffering a great deal of pain. He told me that some short time before he had been engaged in a political discussion in a fruit store, and had picked up a rather hard pear and had bitten into it. He felt a little shock for a moment, but it passed away; and soon after, this pain commenced. I treated it for some months, apparently effecting a cure several times, but only for the old condition to return. The pulp was alive. The outer plate of the process became necrosed, and I removed it. Finally, after months of treatment, the gentleman decided that he would not suffer any longer with it, and I took the tooth out. I found on the lingual surface of the root, a little above the margin of the gum, commencing perhaps the thirty-second part of an inch above the gum and ending about as far from the end of the root, an immense cavity, caused by absorption. The opening into the cavity was not large. It was more like a cave than anything else, the cementum being absorbed very much less than the dentine; as we sometimes see cavities in the crowns of teeth having but small openings through the enamel but the dentine being very badly decayed. In this case it was absorption. Evidently a shred of the hard pear had penetrated between the gum and the root of the tooth, and caused irritation sufficient to start an absorption there which carried away the tooth-substance. But until the tooth was extracted I was certainly at a loss to know the cause; it could be seen only upon extraction of the tooth. That was a very obscure case, as is the case presented by Dr. Hill.

Dr. Perry. I don't think we, probably none of us, can judge fairly in Dr. Hill's case. It looks as though it might be absorption, but we have no means of telling that. I wish Dr. Frank Abbott would look at that tooth and tell us what he thinks about it.

Dr. Theodore Frick. Is it not possible that in this case of Dr. Hill's the inflammation may have arisen through infection? There are certain kinds of micro-organisms that get under the gum and into the circulation, causing inflammation that would be followed by suppuration. There are cases where similar inflammation has been caused by infectious poison of certain insects. Certain micro-organisms may get under the gum and cause that inflammation, the pulp being alive.

Dr. Frank Abbott. In my judgment this is a case of pyorrhea alveolaris pure and simple. That is what it looks like, and I do not think there is any question about it whatever.

Dr. Dwinelle. Necrosis of the jaw and alveolus is rare, but it sometimes does occur. I had one case about a year and a half ago, the patient being a gentleman eighty-three years of age. The disease manifested itself about the superior cuspid, being deep-seated, and

certainly could not have been a case of pyorrhea alveolaris. It ulcerated and discharged freely. The tooth was alive at that time, and it is to-day. I treated it as I have treated cases of abscess. It healed and became perfectly sound. It was a pure case of necrosis. I took out quantities of dead bone.

Another case about six months ago, a lady of about forty; there was quite a free discharge around a right superior incisor, all around the border of the root on both sides, within and without. I became satisfied that the tooth was alive and I treated it in the same way, removing the dead bone from within, and it healed up perfectly and the tooth became all right and normal.

Dr. Jarvie. I did not suppose that there was a doubt in the mind of any gentleman in the room but that this case of Dr. Hill's was one of pyorrhea alveolaris, which simply means pus discharging from the alveolus. Dr. Hill wanted to know the cause of this condition, I think. Pyorrhea alveolaris does not necessarily mean the presence of tartar.

Dr. Dwinelle. I should think the cause was the constant percussion or hammering upon those teeth from below. If when the trouble first appeared a portion of the tooth that antagonized upon it had been removed, to take off the contact, as our friend from Boston would say, probably further trouble would have been avoided.

The President. That is called the grindstone cure!

Dr. Dwinelle. Yes.

Dr. Hill. I did not see the case until all these conditions were manifest. Dr. Dwinelle now reminds me that the first thing I did was to cover the lower molar teeth with a gutta-percha plate, which he wore for some time, as it gave him relief by opening the bite. I do not know how long he wore it, as I have not seen him until two days ago, when he came in my office and I requested him to come over here.

Dr. C. F. Ives. Some weeks ago I received a letter from Dr. Geo. L. Parmele, of Hartford, Conn., who informed me that he wished to contribute a book to our library. I referred him to the curator, Dr. Bronson, and Dr. Parmele sent the volume to him. I think Dr. Parmele's endeavors to provide a library for the Odontological Society are very worthy, and should be acknowledged. I move that letters of thanks be sent to Drs. Parmele and Wainright for their kindness.

Dr. Dwinelle seconded the motion, and it was so ordered.

The President. Gentlemen, we will now pass to the subject of the evening, which is to be presented to you by our essayist whom I have the pleasure of introducing,—Dr. W. Xavier Sudduth, of Philadelphia.

Dr. Sudduth. Ladies and Gentlemen: For the past ten years I have been more or less connected with the universities and schools of this country and Europe, and the subject of education is one of great interest to me. I have taken pains to investigate the subject to the best of my ability, and the facts that I present here to-night, although hurriedly written, are more or less my convictions upon the subject of

Higher Education as Pertaining to the Dental Profession.

Philosophers tell us that force, once set in motion, never ceases to exist, but spreads and extends, ever widening and expanding its boundaries.

In considering the history of dentistry, beginning with empiricism and charlatanism, we have an example of the growth of a profession. Step by step she has marched grandly forward, out of the quagmires of her birthplace, in which she lay almost buried under secret methods, remedies, and closed laboratories, until to-day she stands knocking at the door of medicine, asking to be admitted bodily as a specialty in that profession. Such has been the history of all branches of the healing art. Of this surgery for instance is a marked example; beginning as an art, she has developed into a science: and such will also be the history of dentistry. Dentistry stands to-day the most liberal of the arts, craving for that instruction in science which shall entitle her to the same recognition in the world of science as is accorded to surgery. The question that confronts us is, how to attain this coveted position. That medicine is willing to meet her more than half-way is shown by the action of the American Medical Association and the Ninth International Medical Congress. In voluntarily seating the members of the dental profession on terms of fellowship, the Americal Medical Association has removed the self-imposed stigma of inferiority which has rested upon the dental profession. Upon presenting a paper to the Illinois Dental Society in 1884, I made the following remarks: "We constantly hear the complaint from dentists of non-recognition from the medical profession. Gentlemen, the fault lies with ourselves. Let us prove ourselves worthy of recognition, and it will be accorded without reserve. What we of the D.D.S. need is more D.D.S.,—a broader culture, and not more degrees." That prophecy has come true. Full and fair recognition has been accorded, and now I say that all that is yet needed to make dentistry a specialty in medicine, is to embody the medical curriculum in the dental course of study; or what is better, to unite our dental colleges with reputable medical colleges. That dentistry may be practiced as a specialty in medicine, as much as are surgery or ophthalmology, no one can doubt; but

that it is not so practiced by all, or even by a fair minority, must also be admitted. The relation that dentistry occupies towards surgery is very well represented by the position or relation of the optician towards the ophthalmologist. Oral surgery includes dentistry; but dentistry does not include oral surgery. A medical degree is necessary to insure immunity from prosecution in case of bad results in surgical operations. Dr. James W. White put the matter in a fair and impartial way in an editorial in the August number of the DENTAL COSMOS, 1887, where he said, "Medicine may properly be said to include dentistry, as no one denies that the latter is a branch of the healing art; but dentistry does not include medicine. Medical colleges may without impropriety confer a dental degree on a properly qualified graduate; but a dental college may not confer a medical degree." Dentistry may be ranked as one of the learned professions, which, by its own force, has attained such a degree of eminence that it has earned the recognition of the medical profession; and one step more is all that is needed to entitle it to recognition as a specialty in medicine, and that is the addition of those few branches to the curriculum which are as yet not included, but the understanding of which is considered necessary in order to obtain the medical degree. The ophthalmologist does not practice obstetrics, nor is it essential for him to keep up his studies in that direction; yet, in order to be a medical specialist, he must, at some time in his career, have mastered that branch of medical science, and have passed an examination thereon. It is not essential that he possess a medical degree in order to be a medical specialist; no more is it necessary for a dentist to have a medical degree to be justly entitled a specialist in medicine; nor even a dental degree to be entitled to practice dentistry. This point seems to have been overlooked in the discussion of the question. Too much stress has been laid on degrees and not enough on attainments. There is no State in the Union, at least so far as my knowledge goes, in which a man may not perfect himself in dentistry or medicine, pass the examining board, and be entitled to all the privileges accorded to M.D.S.'s or D.D.'s. Dr. G. V. Black practiced oral surgery for years on his D.D.S., and his certificate from the Illinois State Board of Medical Examiners, before the Chicago Medical College granted him his honorary degree, which he had richly earned by reason of merit and original research. He never failed of recognition at the bedside in accident cases or in medical societies where he was known, because of being known as a dentist. What the dental profession needs is a broader education, and not more degrees.

Are we, as a profession, specialists in medicine to-day? I answer

most empatically, No. May we, on our D.D.S., become specialists in medicine? I answer as emphatically, Yes; when the requirements of the degree of D.D.S. shall meet the requirements of the State Board of Examiners for the practice of medicine in the several States where the degree is granted. Would I advocate such additions to the curriculum of dental colleges as would consummate such a condition? Most certainly I should; or, what is better, the union of dental and medical schools where the scientific branches can be better taught than in purely dental colleges. Dentistry and surgery are composite professions,—an art and a science combined. The art, however, is more apparent in dentistry than in surgery, because of the different character of the tissues to be operated upon. Dentistry must needs always be practiced as an art by the majority of the profession; but the number of those who are entitled to practice oral surgery will steadily increase. I doubt if ever the day will come when a knowledge of obstetrics, gynecology, ophthalmology, etc., will be considered in law an essential to the acquirement of the right to practice dentistry. The line, however, between the science and the art will be more sharply drawn, and the oral surgeon of the future will be recognized as a medical specialist, either by reason of his having a medical degree, or by having passed an examination which shall be considered by the State board before which he appears as sufficient to entitle him to the right to practice surgery. The surgery of the mouth will, as the years go by, be given up more and more to qualified oral surgeons, but not to dentists as the term is generally used. Let us understand the situation fully, and away with foolish claims to rights we have never deserved, and the possession of which we shall never attain until we have passed the requirements laid down by the laws of the State in which we desire to practice.

The fundamental principles which underlie the practice of surgery and dentistry are identical. The one is an unchallenged specialty in medicine, the other stands on equivocal ground. The difference lies in their relation to the laws governing the practice of the two specialties. When the requirements for the two are identical, then will they stand on the same basis, and not before; and no amount of resolutions or assertions to the contrary will in the least alter their respective positions. The way is plain; and it lies with the individual members of the profession to elect the position which each one shall occupy. I hold that it is not only possible but desirable to elevate the standard of dental education until the title D.D.S. will mean not only Doctor of Dental, but also of Oral Surgery, and will imply qualifications that shall entitle the possessor to the right of the position of a specialist in medicine. I should

further advocate the adoption of a degree of L.D.S., the possession of which should permit the holder to labor in the art of dentistry, and thus supply a need for cheaper dental operations. If the system of indenture that prevails now in Ontario should be adopted in this country, it would be a grand stride in advance. So long, however, as our educational institutions are private corporations and are not under government supervision, such a course of study cannot be enforced. A student who desires to prepare for the practice of dentistry in Ontario must first matriculate in the University, and obtain the right to begin a course of study which is laid down for him. It is not necessary for him to enter any college in order to obtain the right to practice; but he must comply with the regular curriculum of study and finally pass the University examination. The teaching faculty in that country does not examine nor grant degrees, that duty being relegated to a board of regents. One of the stipulations laid down in the course of study is that the student shall indenture himself to some reputable dentist in practice, and his indenture and course of study shall cover at least three years. He is advised to attend one course of lectures, then to spend one year in a laboratory, then to take two more courses of lectures, devoting the time between courses to practical laboratory work. It will be seen that a student so educated has far greater opportunity to perfect himself in the art of his profession than one educated under our system. A boy may enter almost any of our dental colleges, and pass out a full-fledged dentist in the short space of seventeen months; whereas if he indentured himself to a carpenter, for instance, to learn the carpenter's trade, he would be kept driving nails for a much longer time.

It is well that our work as dentists is so largely hidden from view. If we were to be put in competition with jewelers, or even brass-workers, we would be rated as third-class artisans. Gentlemen, this is a sad reflection on us as a profession, but nevertheless it is true, and I fear that in some quarters, at least, the trouble is growing. A professor in one of our colleges said to me the other day, "You may well talk about higher education. Why, the large proportion of the men who come to us have not an idea above polishing a plug." "No," said I, "nor will they until the colleges make the requirements such that they will be compelled to have higher ideas before they can obtain a degree."

I do not think it advisable to do away with the title D.D.S. It has honestly earned a place for itself, and should be retained. But the degree should be made to represent more than it does to-day. Neither do I think it would be advisable for the dental profession at large to obtain the medical degree, the possession of which by the

dental specialist would in many instances necessitate continual apologies for not being able to keep pace with the advances made in the direction which his title would indicate that he should study, because his time is so largely occupied in the one direction that he would become rusty in those medical branches that did not come under his daily observation. Medicine is making such grand strides that it is impossible for the busy practitioner in any specialty to keep himself posted in all the various branches of the science. But that a sufficient length of time spent in acquiring a knowledge of the general principles that underlie the whole system of medicine should be required, no one can gainsay. I would not, however, have the same preliminary course of study prescribed alike for dental and medical students. A dental student should begin his course of study in the laboratory, where those principles that underlie the successful performance of the mechanical operations he will be called upon to perform in the practice of his specialty can be most thoroughly taught. His scientific education should accompany and not precede the attainment of the art. He should be a dentist first, last, and all the time, with an eye single to one purpose. Thus he will be sure to reach success, provided he possess sufficient mechanical skill. Such advice does not pertain alone to dentistry, but holds equally good with regard to surgery and ophthalmology. They are all life-time occupations. A surgeon is not made in a day nor a decade, but must bide his time and work with the one end in view.

Can a man know too much? Certainly not, if he unifies his endeavor and makes his knowledge conserve the attainment of perfection in one channel. The most successful physician from the world's stand-point is not always he who knows the most about physical diagnosis and drugs. Many things go to help make success. While the practice of dentistry does not permit the turning to account of one's personality or social accomplishments to such an extent as does medicine, yet how often do we see men whom we know to be as operators our inferiors in skill and mechanical ability, outstripping us in the acquirement of shekels. Given two men of equal ability as manipulators but unequal endowment as regards breadth of culture, individuality, and presence, and it will not take a Solomon to decide between them as to which will make the greater success in life. Such being the case, how can men say that *such* and *such* branches, because they do not strictly bear upon polishing a plug, should not be pursued during the process of acquiring a dental education? They are a part of the science of medicine, and as such help to give the student an insight into the general principles that underlie the grand system of the healing art, of which dentistry forms no inconsiderable a part.

Dr. G. V. Black, in a paper on specialists and specialties, read before the Illinois State Society in 1884, in speaking of the needs of a thoroughly qualified dentist, said, "The dentist should know well the anatomy of the face, should be conversant with physiology, and should understand the special forms of disease with which he has to contend. He should not, however, be content with physiology and the laws of life, as exhibited in the narrow field he is called upon to treat, but should gather from the whole field of biological and allied sciences, and should bring the proofs of his finding home for the improvement of his specialty. By so doing he will not only increase his strength and breadth of thought, but will become an increased power for good in his day and generation." Dr. Geo. H. Cushing, in opening the discussion on this paper, said that "without those comprehensive views that regard the individual organs as only parts of the whole system, each intimately associated with the other, we cannot hope to attain the degree of excellence that can belong only to the true professional man. Aside from this comprehensiveness, in a strictly professional sense, the true professional man should be as broad in his culture as his intellectual capacity will admit; for such breadth of culture is an immense aid to that breadth of professional view which I have said is so essential to the highest special training."

Prof. W. D. Miller, Berlin, is an example of a man who on his D.D.S. has attained well-earned honors and by his merit as an original investigator and a scientific dentist has wrested from the conservative University of Berlin a degree of M.D. without fulfilling the regular curriculum of study. The German papers were full of the praise which was heaped upon him from all quarters, it being an unprecedented event in the history of the University for a man to be able to pass the examination without having followed the regular course of lectures. How did Drs. Black and Miller obtain their well-earned honors? Not by resolving in societies that they were specialists in medicine, but by resolving in themselves that they would, through progressive study and the channels laid down by the laws of the country in which they resided, become such. What *individual* members of the profession have done, the *body* of the profession may do; and the object of my paper to-day is to create if possible such an enthusiasm in the minds of the profession for higher attainments. It may not be practicable for ali those who sit before me who have not already obtained such recognition to begin this late in life; but they can lay down the curriculum of study and the lines to be followed that will insure such recognition to their sons and daughters.

Previous to the passage of State laws for the regulation of dental

practice, our colleges were private institutions, amenable to nobody save their board of trustees. These were in many instances composed largely of the teaching faculty, and consequently the parties most interested with the financial advancement of the institution with which they were connected. That financial success has in many instances been placed before high scientific attainments, cannot be denied; that the colleges as a rule have followed and not led in the demand for higher education, is an undisputed point; and that those who have had the largest classes have been slowest to enact any regulation or course of study that would endanger their position as regards numbers, also passes without controversy. The laws for the regulation of the practice of dentistry have been the result of the well-directed effort of some one individual, backed by a few earnest followers. This has notably been the case in the law which has just been passed in your own State, and if you will take the trouble to look the matter up, you will find that such was the case in the majority of the States that possess such laws. Institutions, as a rule, are conservative, and are loath to inaugurate rules or lines of action that will endanger their financial condition. They aim to keep pace with the popular demand, rather than to lead it. This is well, and I do not desire to be understood as attacking our colleges, of which, as compared with medical colleges, we should be justly proud. The dental colleges of our land stand to-day in better position to raise the standard of education than do other educational institutions. The National Association of Dental Faculties should have the hearty support of the profession at large.

Students should have practical work in the histological and pathological laboratories. The subject of personal and office hygiene should be taught in connection with our dental departments. Bacteriological laboratories must be established for the study of the micro-organisms that produce nine-tenths of the acid found in the oral cavity. Practical experiments, both in and out of the mouth, must be carried on, in order to determine what conditions are necessary to antisepticize the oral fluids, or at least to inhibit the development of acid-producing fungi.

The Odontological Society of Pennsylvania has quite recently taken a step in the right direction, in devoting a fund which had been accumulating in their treasury toward the equipment of a laboratory for original research in bacteriology. More money is, however, needed to equip fully such a laboratory and meet the daily necessary expenses that accompany such investigation. The prevention of decay lies in the direction of a better hygienic condition of the mouth, and a full understanding of the nature of unhygienic conditions can be arrived at only through bacteriological research.

This work is of such a character that it must needs be done by the few. The busy practitioner has no time to engage in it. He can, however, supply the wherewithal for such research. Unless the dental profession takes this matter in hand and gives it hearty encouragement, it will never be prosecuted. The benefits all accrue to the profession at large, and not to the original investigator.

Regarding the necessity for investigation as a means of growth, Dr. Eliot says, "It cannot fail to be observed that one of the things which makes the profession of medicine a liberal profession is its zeal for scientific research, which animates its representative men throughout their lives. This admirable zeal to discover truth and make it prevail the profession of dentistry must emulate,—indeed, already emulates. In this zeal is to be found, on the one hand, evidence that the profession is entitled to call itself liberal, and on the other, security for steady growth and improvement."

In conclusion, the restlessness shown in the ranks of the dental profession to-day bespeaks a stride in advance. We are stepping out of our youth into the full stature of our manhood. Our acts for the next few years may not all be wise, but good is bound to come of the ferment introduced into our midst by the act of the American Medical Association and the Ninth International Medical Congress. It has been a stimulus, and the body corporate feels within itself both the power and the determination to rise to a more prominent and honorable position among the sciences. Dentistry is not a rival, but an integral part, of medicine. They each supplement the other, and it is by harmonious co-operation that the greatest good may be attained. The very instruction we need to make us a scientific profession must be obtained from medically educated men. We have attained the highest perfection in the art of dentistry, and an affiliation with the medical profession is all that is needed to make ours the peer of surgery and a specialty in medicine.

The President. Gentlemen, you have heard Dr. Sudduth's scholarly paper, and the subject is now before you for

Discussion.

Dr. Perry. Dr. Neymann says that all we can do is to say Amen. I echo that.

Dr. Dwinelle. I would like to emphasize one or two of the points that were so ably presented to us by Dr. Sudduth. Of course this is a subject that we are particularly interested in, the advancement of our profession, of which we have reason to be proud every day of our lives. I speak more for the older members of the profession concerning what has been laid before us to-night, an exposition of

the hopes that we older ones have for the future. I desire particularly to emphasize one point that was brought before us so lucidly and convincingly, and that is that we have overlooked the great advantage that is to be derived from personal education in the office of the operator and the dentist at large. I think our dental colleges overlook this great fact, or underestimate its value. In my opinion nothing can compensate for that knowledge that is derived from daily intercourse with the operator himself; an inside view of his discipline and experience being then obtained. I think that when students go into classes they lose their individuality and become absorbed in the mass, whereas it is particularly essential that students about to enter college should have this personal individual training.

Dr. Abbott. There are a few statements in the paper to which we have just listened concerning this matter of education which I wish to correct. The writer has been misled as far as the New York College of Dentistry is concerned, in reference to the graduation of students after seventeen months' tuition. That I understand is the practice in most of the dental schools, as stated; but the New York College of Dentistry has never graduated a man, to my knowledge, who has not been a student for at least two full years, and a majority of them study from three to five years before graduation. In the Faculty Association, two years ago last summer I think it was, the question was discussed, and a resolution passed that no student should be allowed to come up for final examination until after *two full* years of study. It was thought that seventeen months was not sufficient time in which to learn practical dentistry; but that seven additional months of constant practice was necessary to fit men to graduate with any kind of honor, and to know what to do when they were graduated. That last seven months of practice in the college infirmary is worth more than all the other seventeen. A year ago this last summer the Faculty Association took a *back step* at Niagara Falls, passing a resolution that the year should mean a school year: *i.e.*, that a course of five months was a year. It stands on the books to-day of the Faculty Association, in that shape, that a man may graduate after two sessions of five months each. That is what is done by most of the schools in this country, but not in the New York College of Dentistry. Again, the facilities for teaching in many of the so-called colleges in this country are meagre in the extreme. I need not particularize. Those of you who have studied the subject of education know very well the course pursued by most of the colleges. In the matter of final examinations, too, the faculties of colleges are either very lenient or the most of their students are wonderfully bright, for the remark is often heard that every one gets through who comes up for examination in such and

such a college, and the graduating classes turned out seem to verify the remarks. The institutions must have means in order to run, and to get means they must have students. A big graduating class is supposed to be a good advertisement; and if, added to this, it is understood that none are rejected who are examined, it is a telling card, and the school is full of students in consequence. We have considered and discussed very carefully and deliberately the position the New York College of Dentistry holds in relation to the Faculty Association. As it now stands, we feel that we are being hampered in our endeavors to move forward in accordance with the demands of the more advanced portion of the profession.

There is one other point in the paper that I wish to refer to: that is, in reference to the manner of obtaining the education which shall entitle us to hold the position the action of the American Medical Association and the Ninth International Medical Congress has placed us in. It may be possible, and it may perhaps be well, to have all the departments of medicine represented in our independent dental colleges. It is quite impossible for all such schools to become connected with universities. There is in the minds of many a very serious objection to a university connection, for the reason that no *special* direction is given to the teaching, so that no special education is received by students, except the small amount of practice they get while in college. This if confined to two courses of five months each is, in the best of schools, a very limited amount of practical experience. I have for many years advised all our graduates who could do it to obtain the degree of M.D.; not for the degree itself, but for the information they are compelled to get in order to obtain the degree. The writer of the paper would have the education with the degree of D.D.S. only. I hardly think that would be practicable. No special degree can ever stand in the eyes of the world in the same light that the old and honorable degree of Doctor of Medicine does, consequently students of any specialty will, in my judgment, never see the necessity for the general course of study, unless they are to receive the degree in general medicine. Profs. Black and Miller have been referred to. Both of these men worked for an education; the degree of M.D. came to each of them in consequence of the possession of that education. These are exceptions. Very few men in the world ever did or ever will work for the love of work and the knowledge to be gained, as these two men have done.

Dr. Sudduth. Dr. Abbott has truly said that students must have something ahead for which to work. But I should like to ask how is that broader culture to be attained by the dental profession at large, better than by embodying it in the curriculum of study

necessary to compass before the degree of D.D.S. is granted? Very few will take a medical degree, because it entails practical work in branches that will not be of special use to them as dentists, the "theory" of which can be taught by didactic lectures that will sufficiently well prepare the candidate so as to enable him to pass the required examination on those branches and thus meet the requirements of the State laws governing the practice of medicine. The student in obtaining his D.D.S. would then be entitled to rank as a specialist in medicine, and have acquired that breadth of knowledge which is so essential to the cultured specialist. I would not have dental students become proficient in the art of obstetrics, gynecology, or the allied branches that would not be of direct benefit to him in the practice of his specialty, but I would have him become conversant with the general principles that underlie the practice of medicine, in which he desires to become a specialist; otherwise the position would be one of continual embarrassment, and I say that sufficient ground can be covered by didactic lectures in dental colleges to accomplish this much-desired end. The course of study would, however, have to be lengthened to three years. Dentistry may be and will become a specialty in medicine without taking the medical degree, and this much-hoped-for condition will be brought about, I have no doubt, by and through the action of the National Association of Dental Faculties.

On motion of Dr. Dwinelle, a vote of thanks to Dr. Sudduth for his interesting and instructive paper was passed.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The First District Dental Society of the State of New York held a regular monthly meeting, Monday evening, June 4, 1888, in the hall of the New York Academy of Medicine, No. 12 West Thirty-first street.

The president, Dr. W. W. Walker, in the chair.

Dr. M. L. Rhein, chairman of the Clinic Committee, read the following

Clinic Report.

A stated clinic of the First District Dental Society was held this afternoon, at the depot of The S. S. White Dental Manufacturing Co., corner Broadway and Ninth street. . . . Dr. J. I. Hart operated on a girl aged sixteen, restoring the anterior approximal surface and

portion of the crown of a right superior first molar, starting with crystalloid gold and finishing with velvet gold cylinders, and using the automatic mallet. The tooth before being filled was found to be very sensitive, and Dr. Ottolengui tried the ether spray on it. Complete anesthesia of the dentine followed, but in about five minutes the effects had entirely passed away, and the filling of the tooth was quite painful. . . . Dr. B. A. R. Ottolengui, of New York City, gave a large and varied clinic. He first demonstrated the value of the ether spray. The patient was a young lady of nervous temperament, having a posterior approximal cavity in a left superior lateral. It was very sensitive, and complete anesthesia was produced; also, in a sensitive cavity in the crown of a left inferior second molar of a young man. He then exhibited in a young lady's mouth a superior right first bicuspid implanted eight weeks ago, and a superior left cuspid implanted six weeks ago. They were both in first-class condition. Dr. Ottolengui then implanted in a young lady's mouth a right superior second bicuspid. The tooth implanted had been extracted February 5, 1888, and had since been kept in a solution of potassic iodide of mercury, 1 grain to 6 ounces. Following the suggestion of Dr. G. L. Curtis, of Syracuse, he first peeled off the pericementum. The canals were filled with chloro-percha. He used the ether spray before cutting through the gum. . . . Dr. C. C. Carroll, of Meadville, Pa., exhibited his apparatus for casting aluminum, and cast a practical case for one of Dr. Carr's patients. . . . Dr. L. G. Wilder, of Brooklyn, exhibited a patient in whose mouth the ridge had deteriorated into a soft, cushion-like state, and the palate showed evidence of severe inflammation following the wearing of a vulcanite denture. On account of the great amount of absorption, he failed to get any plate to suit until he inserted the cast aluminum denture, which he exhibited in the patient's mouth. . . . An interdental splint made by Dr. A. J. Burns, of Fairport, N. Y., was exhibited. . . . Dr. H. H. Sisson, of New York City, exhibited his improved mandrel for carrying disks either in a concave or convex position. . . . Dr. Thayer, of Brooklyn, exhibited a new cement the color of chocolate. . . . Dr. M. L. Rhein, of New York City, exhibited a ribbon of gold with a few traces of platinum and iridium. This had been rolled out of a filling of crystalloid gold covered with platinum and iridium, which was inserted in a matrix before the New York State Dental Society in May.

Dr. Rhein. I would like to hear the views of some members who saw the experiments of Dr. Ottolengui with the ether spray this afternoon.

Dr. A. R. Starr. I did not have the opportunity to see the experi-

ments of Dr. Ottolengui, and I would like to ask some one who did whether Dr. Ottolengui used any obtunding agent before applying his anesthetic; and also whether the application of the ether spray did not itself produce considerable pain?

Dr. Rhein. He used a hot-air blast before the ether spray; and the ether spray did produce a great deal of pain. The question in my mind is whether the spray was not more painful than the excavation of the sensitive dentine might have been without it; but at a certain stage the pain suddenly ceased, and there is no question but that it produced complete anesthesia of the dentine.

Dr. Starr. I would like also to ask whether Dr. Ottolengui has used this process for any length of time, and whether he has experienced any bad after-results in consequence of the sudden application of cold.

Dr. Ottolengui. I have used this method for about a year, and I have had no bad results in any case. I will say further that I do not use the ether spray on every tooth I fill. I find that in many cases the patient is willing to submit to slight pain caused by excavating, but there are some cases which appear to be so very bad that it has been my habit heretofore to give the patient gas, and it is in those extreme cases that I now use the ether spray. Therefore it may be said that I use the spray only where nothing else will do; and it is effectual in those cases every time. As to how much pain is caused by the spray, I think Dr. Rhein has magnified it a little in his report. In cases where I have once used the spray I have invariably found that the patients preferred the next time to endure the pain of the spray rather than the pain of cutting. I have tried every kind of agent that has been suggested in the last three years in any dental journal, and I have seen none that produces anesthesia in the teeth and the exemption from pain that this spray does. I requested the members of this society and the Brooklyn society and the New Jersey society to bring patients to the clinic this afternoon and test the method for themselves, but no one brought a patient. If they had brought their patients I would have shown them that the pain of cutting sensitive teeth can be controlled in this way; and no one will believe until they see it how completely it is controlled. This is not a little makeshift thing, like creasote, that has to be repeated every minute or two. You apply the spray once, and then you can cut the tooth all you want to and finish it up and be done with it. Dr. Neymann here allows me to state that I went to her office and there operated in a case where the teeth were exceedingly sensitive, the necks of the central incisors so much so that it was impossible for the patient to brush them. I applied the ether spray and then burnished them with a steel burnisher. That was two

months ago, and the doctor tells me that the patient reports she can use the brush with perfect comfort.

Dr. Baldwin. A word in regard to the case Dr. Ottolengui had at the clinic. Judging from the action and appearance of patients under pain when they have the rubber-dam over their teeth and cannot speak, I think that in the case of Dr. Hart's patient there were indications of a good deal of pain, but I am convinced that there must have been much general anesthesia, because of the ether spray under the patient's nose. Permit me to report a case that recently came into my hands. The lady had worn an entire denture of rubber, she said, thirty odd years. It was made as a temporary plate. The rubber had broken away from the front teeth, and tissue had formed in there to fill up the space. The difficulty I met with was that the plate on the left side of the jaw was not resting on the alveolar ridge at all; there was what seemed to be a callous ridge or artificial cartilage that extended from the symphysis back to the ramus of the jaw on the left side, and the plate rested on that. At the two points next to the jaw it was free and movable. Depression at the center would depress the whole. It seemed like an extra ridge, lapping over and covering the natural ridge of the jaw. I was not able at that time to get an impression that would be at all useful in making a plate. I treated it with Listerine and tannic acid for two weeks, which softened the callus. Afterwards I made a plate of Kingsley's metal, which forced the overlapping tissue away from the alveolar ridge, allowing the plate to rest in its proper position. Then an impression was taken and the cast made, which I pass around. The lady had not complained, and was not aware that the plate did not fit. It is surprising such a thing could be kept in the mouth. The difficult and dangerous part of the case was that at the attachment of the tissue, running down from the soft palate where it united with the tongue, there were two projections of soft tissue having the appearance of warts, only they were red, and not firm like a wart. It was evidently a case of epithelioma. I treated it with salicylic acid and glycero-tannin, which reduced its size considerably.

Dr. Atkinson. When we have heard the statement that artificial cartilage can be produced in the jaw or in the mouth at all we want it defined to us, and to know how it differs from natural cartilage.

Dr. Baldwin. I did not say it was artificial cartilage. I said it appeared like it.

Dr. Atkinson. How do you define it? Have you seen artificial cartilage? If you have not, how can you say this growth looked like artificial cartilage?

Dr. Baldwin. I said the growth looked like artificial cartilage; I did not assert that it was. I do not see why it is not proper to

compare a strange thing with something that we do know. We know what cartilage is, and I speak of this by comparison, the same as the last speaker did when in describing a similar case he spoke of the tissue as having "a tomato-like appearance." I do not know what tomato-like tissue is any more than I know what artificial cartilage is. We must use such comparisons in order to make ourselves understood.

Dr. Rhein. The term epithelioma as applied to the case reported by Dr. Baldwin seems out of place; the facts detailed by him do not at all bear it out.

Dr. Baldwin. That was a very unusual case, and it seems to have caused a good deal of discussion. Knowing it was something unusual, I made a drawing of it, which I have here to show to anyone who desires to see it. It is from a cut in one of the dental books, and to that I have added the portion that I designated as an epithelioma. In connection with this I spoke of what seemed to me to look like artificial cartilage. You may call it cartilage if you please.

Dr. Rhein. May I ask the doctor from what appearances or symptoms he diagnoses that as an epithelioma?

Dr. Baldwin. I considered it an interesting case. I consulted Dr. Atkinson, who was treating a case which he diagnosed as an epithelioma. I saw the similarity of the cases, and the "tomato-like appearance" of the extra growth, that had a base thrown out from the side of the tissue at the union of the soft palate and tongue; warty in its projecting appearance, but not hard like a wart, but an extra tissue grown up, inflamed and red; and from the symptoms given—a darting pain running up to the ear on that side of the face and extra irritation—I described it as an epithelioma, not wholly on my own judgment but from what Dr. Atkinson said in comparison with his case.

Dr. Atkinson. I was pained to-day at the clinic to see the utter want of intelligence and fraternal and professional etiquette, as well as consideration for the patient, that were manifested by several individuals speaking to the lady who was having a tooth implanted and prophesying what was going to be the result all the way through. They ought to have been told openly that they were incapable of learning, and had not the least conception of the operation. They so bedevilled the mind of the operator that he had the cavity stuffed with something to arrest hemorrhage. When you are making a surgical operation make it thoroughly if the blood does flow, and do not interfere unless you find that you have by accident wounded blood-vessels; then take care of them. You should understand the anatomy of the parts before you undertake to make operations. When I came in and saw he had cotton in the cavity to arrest the

hemorrhage, I said "Go on and set your tooth." "But we are not ready." "Then get ready." They did get ready, and put the tooth in place without any bleeding.

I have never said that implantation would be a success. I have said, and I say now, that it looks as if it would be a grand success, and a more pronounced success than in the history of any other operation that I have followed through my professional career. It is not prophesying to state facts. I have several interesting cases to report. I saw a case said to be pyorrhea alveolaris, but which was nothing but a case of alveolar abscess. I made a diagnosis, and advised the patient to go to the gentleman who first had charge, as I felt disinclined to interfere with the rights of my fellow-man. I understand that the patient did not care much about that, so it went into other hands. I have seen the tooth since. The mistake in the first place was that it was supposed to be a pulpless tooth; and the dentist did not adopt the method of drilling into a pulpless tooth which I have detailed before this body a great many times. It is possible, however, that there are some here who may not have heard of that manner of treating a tooth under high inflammatory action. It is to first tie a cord around the tooth and make a loop in the cord to hold securely some sort of handle by which to draw it down, and thus compensate for the pressure made in drilling, and then drill through. This tooth was drilled into, but not through, without any such effort as that to prevent pain; and the patient being restive, the operator concluded it was a living pulp, and did not go through the end of the root, and hence it went for six months without treatment until brought to me.

The trouble was the result of a blow of the gold-beater's mallet striking the face, and not from constitutional degeneration located about the dental ligaments. The case will probably go into history, and it may be a bone of contention some day.

In the other case the patient did wear artificial teeth made, according to the report, by one who used to make continuous-gum work for an operator having a fine practice. They had been worn for thirty odd years. About a year ago, while in California, she was troubled with some uneasiness in the roof of the mouth and throat, and a doctor told her he could correct the difficulty: he would make her something that could be worn. He put in the thing pre-eminently fit (?) for inflamed mouths—rubber. Her mouth became so sore that she came East. She had a continuous-gum set, upper and lower, made by J. H. Smith, whom I regard as one of the best porcelain workers. Finally she took it into her head to visit me. I found an epithelial enlargement of the anterior and posterior faces of the soft palate, covering the uvula completely, and having

a kind of tomato-like appearance in the vault of the roof. I repeat and maintain that it was tomato-like; it was lobular with deep fissures, and the color of a tomato. The case was carried forward through eight or ten successive steps to get that growth away from the curtain of the palate, and in four days it sloughed completely off. It was so tender that I could not preserve it. To-day there is as nice an uvula, curtain, and palate as there is in any baby's mouth. The growth in the roof forward of the junction of the hard and soft palates was painted with a saturated solution of salicylic acid in alcohol. I have preserved casts of the several sloughs of this mass showing size and shape accurately. This morning an impression was taken above and below for an entire set of artificial teeth; and I defy any man to say that there is anything more than a little bit of freshness of appearance in the membrane of the mouth. It will be seven weeks to-morrow since she first came to me. I hope to put such a set of teeth in her mouth as will be a comfort to her, and wipe out the epithelial growth, whether it should be called epithelial or not. I did not think of taking an impression of the mouth at first. The success has been simply from the use of the coagulating power of salicylic acid, which accomplishes such work in a finer manner than I have ever seen or heard of before.

Dr. William Carr explained the bearing of the amendments to the dental law recently passed by the Legislature of the State of New York and signed by the Governor.

The society passed a vote of thanks to Dr. Carr for his earnest and successful efforts in securing the passage of the act spoken of.

Adjourned. B. C. Nash, D.D.S., *Secretary*.

AMERICAN MEDICAL ASSOCIATION.—SECTION OF ORAL AND DENTAL SURGERY.

REPORTED FOR THE DENTAL COSMOS BY F. W. SAGE, D.D.S.

Third Day.

(Concluded from page 524.)

The election of officers for the ensuing year, which took place upon the assembling of the section, resulted as follows: F. H. Rehwinkel, M.D., D.D.S., Chillicothe, Ohio, president; Eugene S. Talbot, M.D., D.D.S., Chicago, secretary.

Dr. Rehwinkel returned thanks for the honor conferred upon him, and promised to discharge the duties of the chair to the best of his ability. He was fearful that many dentists do not yet appreciate the opportunity of placing the profession on a higher plane, which has been so generously offered by the American Medical Associa-

tion. The splendid success of the dental clinics at the meeting of the International Medical Congress might be repeated, on a smaller scale, of course, in this section. He hoped that the entire dental profession will heartily co-operate in making this section equal in practical results to any in the Association.

Dr. W. C. Brittan, Detroit, Mich., read a paper, with micrographic illustrations, on "Dentogeny," in which he described appearances not previously recorded and advanced views on a number of points diametrically opposed to the usual interpretations. To the "dentinal groove" of writers—sometimes, though not always—observed at the time of the thickening of the epithelium over the future alveolar border, he thought no histological importance could be reasonably attached, because it is not always present. Later a change is seen to occur at certain points in the cells of the epithelium, consisting of an enlargement of the cells and their nuclei,—these points corresponding nearly to the positions of the future teeth. The changed epithelial structure dips down into the adjacent embryonic tissue in the form of "cords," the outer layer of cells of which have a columnar form. These epithelial cords later form what is known as the "enamel-organ," which is concerned mainly, but not wholly, in the production of the enamel of the teeth. Coincidently increased activity in the cells of the submucous tissue adjacent to the cords results in greater density at points sometimes beneath the cords, sometimes at one side,—often upon each side, when the enamel elements for two separate teeth of the same type are furnished from one cord. These cell clusters gradually assume a papilliform appearance, pushing up against and becoming nearly enveloped in the overlying cord, constituting the so-called "dentine-germ or organ." Rapid developmental changes now occur. The cord, by separation of its walls, becomes "stirrup-like" in form, its base conforming to the contour of the "dentine-organ," until it covers the portion that is to compose the crown of the tooth in the form of a cap which separates from the original cord by the breaking up of that structure. (The prevailing dogma that the enamel-organs for the permanent teeth are supplied from the cords of the temporary is incorrect; they are derived directly from the mucous epithelial layer.) The cells in the interior of the "enamel-organ," occupying all that part between the wall in contact with the dentine-organ and that in contact with the sacculus proper, have now assumed the stellate form and are known as the "stellate reticulum," and at the point where the enamel-organ embraces the cervical portion of the embryonic tooth the wall of the organ is folded upon itself. The outer investment has lost all appearance of a columnar cell layer, and is now composed of a system of vessels

and capillaries distributed through a fibrous membrane whose cells (mostly fusiform) lie parallel to its surface. The inner wall retains the original columnar form of the cells, although greatly reduced in size. These changes might be accounted for mechanically. The sacculus, which is the product of the surrounding embryonic tissue, exhibits two well-differentiated structures: the outer layer being composed of fibrous connective-tissue elements of somewhat loose texture, and the inner, in contact with the outer investment of the reticulum, of much finer structure and containing a profusion of nucleated bipolar cells with long and highly refractive processes, and lying mainly parallel to the surface of the organ, in the outer wall of which they seem to be interwoven and to connect upon the other side directly with the processes of the stellate cells. The processes of these cells form a like connection with those of the *stratum intermedium*, and these last form true axial connections with the columnar cells of the enamel-matrix, where they are joined by lateral processes which constitute the transverse lines marking the upper boundary of the matrix-cells, which are again joined in the same manner where they come in contact with the dentine-organ to form the boundary here. Thus also is formed the supposed membrane between the enamel and the dentine, which consists simply of a mesh or net-work composed of the lateral processes of the matrix-cells. These matrix-cells also send axial processes beyond this border line and into the dentine-organ, where nucleated enlargements occur in them. Thus they become those columnar bodies known as "odontoblasts." As the elements required for the work of building are derived from the blood-constituents, and the blood-supply of the enamel-organ comes from the capillaries at its outer investment, the blood-constituents probably receive such elaboration in passing through the reticulum as fits them for their final place of deposit. Herein consists the function of the stellate structure. The nuclei of the stellate cells, where a deposit of enamel is about to occur, show a marked increase in size, and appear as highly refractive, spherical, opalescent bodies. Two or more courses of these appear in the upper part of the matrix-cells, where they have been termed the nourishing cells of the enamel-organ. They are not developed within the enamel-matrix, but are identical with the cells of the reticulum, and probably constitute the calcific elements of the enamel. By some means they find way within the matrix-cells, where, superimposed one upon another, coalescence occurs, thus forming the rods or prisms of enamel, the matrix-cell walls becoming the cement-substance between them. Associated with the first deposit of enamel, which occurs coincidently with that of the dentine, the upward push of the growing tooth-germ so encroaches upon the retic-

ulum that the portion lying in contact with the matrix-cells is folded upon itself, thus forming the *stratum intermedium.* As a result also of the outward push of the tooth, the matrix, with what remains of the reticulum and its outer investment, gradually assumes the form of an attenuated layer over the entire crown,—the mythical membrane of Nasmyth.

The enamelization of the crown is now nearly completed, but the function of the organ, or rather of what remains of it, does not end here. Although the organ extends quite a distance below the cervical line where the enamel is to end, the nuclei in the reticulum are not developed below that point, which fact, taken in connection with the general conformation of the parts, indicates that at this point the crown is to be finished, and all below that is the developing root. It is just as evident that the tooth in its outward growth passes directly through the remains of the enamel-organ, which now becomes the matrix for the cement-substance of the root and the boundary line for the dentine of the same. Here probably ends the office of the enamel-organ, so far as developmental function is concerned, its life's activities having been spent in erecting to past usefulness a monument composed of the most enduring tissue of the whole body.

The main distinguishing features between dentine and enamel are chemical and structural. The same chemical elements enter into both, but in different proportions, and notwithstanding the well-marked differences between them, which have probably often led investigators wide of the truth, there is little if any difference in the mode of working. The dentine-organ, as stated, is developed in and probably from the embryonic elements of the submucous tissue. The blood-vessels developed at its base shoot upward into its substance, rapidly becoming a dense and arborescent system, running mainly parallel to its long axis, with numerous fine branchings as they approach the upper boundary, where they appear to end in loops. The substance of the organ appears a granular mass; its cells are small, variously formed, and joined by very delicate processes, forming another stellate structure analogous to that of the enamel-organ, and probably with the same functional characteristics, though with a widely differing environment. Previous to the deposit of dentine there occurs what has been supposed to be a metamorphosis of the cells along the border-line in contact with the enamel-matrix, which now assumes the appearance of a columnar layer,—the so-called "odontoblasts," which, as before stated, are only nucleated enlargements of the axial processes of the matrix-cells of the enamel-organ, which penetrate the dentine-organ along this border and are again joined by fine processes to the deeper cells of that

structure, thus forming a continuous system. The axial connections of these columnar bodies form the "dentinal sheaths" or tubuli; their axis-cylinders the dental fibers. The branchings of the "tubuli" are a result of a fusion of two or more of those bodies.

All this is very unorthodox, but so we see it. Since writing the above, it has through subsequent observation occurred to me—almost to the point of conviction—that in its inceptive development the dentine-germ is indebted wholly to the enamel-organ for the stimuli requisite for such a purpose. In other words, the enamel-organ is the inceptor of the dentine-germ. No tooth is developed without the predevelopment of such an organ. Even in the types which have no enamel, the formation of an analogous enamel-organ is the first inception. Its existence therefore would seem to imply that it must bear some significant connection with the formation of the dentine-germ.

Dr. M. H. Fletcher, Cincinnati. . . . Only those experienced in such work can appreciate the amount of search, thought, and reasoning necessary to prepare such a paper as this. The whole field of embryology presents no more formidable barriers and difficulties than are met with when we undertake the study of the dental system of animals. Notwithstanding the attention it has received from learned scientists, the subject is still involved in great obscurity. The paper clearly indicates the writer's love for this work. What he has called the "dental groove" would more properly be termed the dental *ridge*, since, according to Sudduth, no "groove" is visible until we have lifted up the rampart or ridge of epithelial cells, which exposes a groove. Again, "the enlargement of the cells and nuclei at points corresponding nearly to the position of the future teeth"—to quote his words—has not, to my knowledge, been noted by other writers. Some authors speak of a proliferation of the cells, their size remaining the same until the dipping down of the cord has occurred, and some investigators have claimed that at this time the cells of the Malpighian layers assume a columnar form. The latest investigations seem, however, to show that the cells of these layers are oval or cylindrical until the cord comes in contact with the dentine-papillæ. *After* this occurs they take on the columnar form and evidently become ameloblasts.

The stirrup-shape of the enamel-organ of which he speaks is only the form seen on making sections of the tissue. As a matter of fact, the organ is bell-shaped, forming a hood over the dentinal papillæ. In another part of his paper he calls it a cap.

The doctor exhibits, in a section shown, that at the point where the enamel-organ embraces the cervical portion of the embryonic

tooth, the wall of this organ is folded upon itself, thus bringing the walls into mutual contact. No other author, to my knowledge, has observed this. Other investigators represent this portion as free from such conditions. It is not, at all events, of any special significance, since it does not closely concern any part of the development.

The point of importance in the paper, and that which has the greatest claim for originality, is his theory of the origin of the odontoblasts. After speaking of the numerous lateral processes given off by the ameloblasts, or "matrix-cells," he says, "And thus is formed the supposed membrane lying between the enamel and the dentine, and which consists simply of a mesh or net-work composed of the lateral processes of the matrix-cells. These matrix-cells also send axial processes beyond this border-line and into the dentine-organ, where nucleated enlargements occur in them. Thus they become those columnar bodies known as odontoblasts."

This certainly gives to the odontoblasts an entirely new origin, for up to the present time they have been considered as a modification of the cells of the sub-epithelial tissue, in like manner as the ameloblasts are a modification of the Malpighian layer. The layers of cells at the summit of the dentine-papillæ, which come into nearest contact with the enamel-organ, are the ones thus converted into odontoblasts. To claim that any lateral process of a cell becomes nucleated and forms a cell of another class certainly, to my mind, is a perversion of the laws of morphology to some extent. If there is any one truth established in this branch of science, it is that when nucleated cells divide, the division of the nucleus, as a rule, precedes that of the whole cell. If Dr. Brittan could demonstrate that the matrix-cells generate a second nucleus which passes through this basement-membrane, it would add much to the rationality of his theory. The development of the cell is, however, a gradual process, proceeding from a general to a special state. We can conceive how the sub-epithelial layer, in the process of differentiation, might develop from the epithelium,—or the reverse. But the processes of amelification and dentinification are, according to the essayist's own definition, quite different,—would require different kinds of cells,—would require a change from epithelial to sub-epithelial structure, before these cells could be converted into organs differing as widely as do the enamel-organ and the dentine-organ. These processes are extremely difficult to trace, and it is easy to fall into error in the attempt. Legros and Magitot say in regard to the process of the stellate cells, "It is a remarkable fact that no line of juncture can be discovered where these cells are connected with each other. Various reagents fail to disclose the least trace of it." This certainly holds good as regards any process given out by

the ameloblasts at this stage. I concede that the new theory does credit to its author. It may be true, but I think the chances are against it. The fact that even in that type of teeth which have no enamel the enamel-organ is to be found, in the earliest stages of tooth-development, does not establish his theory. Many cells act catalytically on their environments. It is therefore not improbable that this action is the influence given out from the enamel-organ, and is necessary for the incipient development of the odontoblast layer.

His description of the manner in which enamel is probably formed is good. He describes it as the superimposing one upon another of the spherical cells or nuclei from the "*stratum intermedium*," within the walls of the matrix-cells, and says that the lateral processes of the cells and the cell-walls may form the boundaries to the enamel-prisms. One illustration (No. 6, B) shows the enamel-organ with its stellate reticulum to be present over the particular part of the tooth in which the enamel is being deposited. This illustration, if properly understood, disproves the theory of Sudduth on this point, in which he claims that there is no deposit of enamel until the reticulum disappears. The essayist seems to regard Nasmyth's membrane as a myth. It seems, however, to be pretty well established that the remains of the enamel-organ form Nasmyth's membrane. Dr. Brittan represents this enamel-organ as a most versatile affair. According to his theory it first prepares and forms the enamel, then it gives the necessary cells to the dentine-organ. He thinks that without it dentine could not be produced. Before it ends its existence he has it inclosing the root of the tooth and producing the cement, which is much less like enamel than dentine. I think it will be found difficult to maintain the premises upon which he bases his conclusion in attributing this latter new function to the enamel-organ. The two processes of the formation of bone and cementum, which closely resemble each other, must be very similar. It is properly claimed that cement is a subperiosteal product stimulated into growth by the same causes which effect the formation of subperiosteal bone. The difference between it and true bone is probably due to the necessarily confined limits in which this tissue is deposited, since the periodontal membrane, according to Sudduth, has the special superintendence of this deposit, and is simply a continuation of the periosteum. But what part the enamel-organ can possibly have in the production of cementum, primarily or secondarily, is not easily seen. Moreover, the tissues necessary for the production of enamel are not at all necessary for the production of cementum or bone. Authors differ as to the sources from which the cords of the permanent teeth are derived. The almost universal belief among the latest investigators is that the cords for the twenty

anterior permanent teeth are developed from the cords of the twenty corresponding temporary teeth (instead of from the epithelium, as the essayist thinks), and the cord of the first permanent molar from the epithelium, that of the second molar from the cord of the first, which in time gives off a cord for the third molar. There are specimens showing deviations from this rule, but they seem to be mere irregularities.

I deem it only just, in closing my remarks, to say that since there is no standard in this matter, on account of extreme difficulties surrounding such minute investigations, all we can do is to compare the work of the essayist with that done by other late investigators. When one has acquired perfect familiarity with the mechanical workings of the microscope, then comes the original work he must undertake. Just here we meet our greatest difficulty, for we have reached the limit of our appliances and reagents. We may allow imagination to go on, reasoning from homologies and analogies; we may form theories and try to establish them. As improvements may hereafter be made in our means of investigation, our theories must stand or fall as they are found to be based on fact or fiction. And it must be remembered that these conclusions are generally brought about by the demands and the discoveries of just such faithful workers as our essayist. To him, therefore, are due the hearty thanks of all interested in this or in kindred work.

Dr. H. A. Smith, Cincinnati. This theory is certainly quite novel and ingenious, but it is entirely at variance with our teachings to the present time. None of us can say that it has not a modicum of truth in it until we have been over the ground. He tells us that the enamel-organ is the stimulus of the parts above it,—according to his conclusion. That is not new. In that way we suppose supernumerary teeth are formed. Again: the characters of the three tissues—enamel, dentine, and cementum—are so different that it seems to me impossible that the same organ should produce them all. At Washington, Dr. Andrews gave to the odontoblasts an office entirely different from what we have been learning. As regards Nasmyth's membrane, we find in children, shortly after the eruption of the incisors,—often before their complete eruption,—a hard deposit near the gum-margin,—a greenish deposit called tartar by some authors. That I have always regarded as the remains of Nasmyth's membrane.

Dr. Fletcher. How do you account for green tartar on adults' teeth? I have seen it as green as the leaves of a tree on the teeth of persons twenty-five years old.

Dr. Smith. It may be the effect of some particular occupation. I have in mind an instance: a brass-foundryman who applied at the

Ohio Dental College for some service, whose teeth were stained of a greenish copper color. These stains were with great difficulty and labor removed. Within four weeks the teeth were again as green as though they had never been cleaned.

Dr. Fletcher. I will add a word to my remarks on Dr. Brittan's paper. His theory respecting the prismatic formation of the enamel I have found in no other author. It looks like a very reasonable view,—a great deal more reasonable than the other view that the odontoblasts can give off a process which becomes enucleated and forms a new cell. The existence of Nasmyth's membrane—which he questions—can be demonstrated by macerating a tooth in acid, when the membrane can readily be peeled off. Dr. Brittan does not say why he thinks this membrane is a myth.

Dr. H. A. Smith. He is not alone in that statement. Tomes says the existence of the membrane is difficult of demonstration. The doctor makes a confident and unreserved statement regarding the origin and mode of formation of the odontoblasts, which is contrary to commonly received theories. It is certainly very interesting, and if it could be clearly demonstrated would settle a question which has been much debated.

Dr. John S. Marshall, Chicago, saw nothing unreasonable about the essayist's theory, excepting his views regarding the prolongation of the processes forming the odontoblasts.

Dr. E. G. Betty, Cincinnati, next read a paper on the "Care of the Deciduous Teeth," a synopsis of which is given:

When we consider the relations the deciduous teeth bear to the proper eruption of their permanent successors, their use in masticating,—which at best is but imperfectly done at this early period,—their function in assisting the normal development of the bones of the face, we are impressed with the necessity of interfering to preserve them until nature provides for their displacement. These teeth are not constructed upon the permanent basis of the permanent teeth. Their quality depends largely on the general physical qualities of the child itself and on the ability of the mother to properly nourish the infant. As a rule, extensive decay in the teeth leads to exposure, inflammation, and death of the pulp; frequently alveolar abscess follows, and sometimes necrosis. We are tempted by the entreaties of the mother and the sufferings of the child to extract at once, thus inflicting a damage oftentimes which will become apparent and reproach us in after-years. What can we do? In cases of exposure and inflammation, remove débris as far as possible, and apply hydro-chloride of cocaïne. After half an hour, when the pain has subsided, remove any remaining débris and apply a

paste of iodoform mixed with alcohol or glycerin. Cover this with a loose pledget of cotton moistened with compound tincture of benzoin. After twenty-four or thirty-six hours, if there has been no pain, apply fresh iodoform, covering it with a solution of gutta-percha in chloroform, and flowing oxyphosphate of zinc mixed thin over this. If the recent death of the pulp is indicated, make a vent at some convenient point, where it is not likely to become clogged with foreign particles,—the gingival margin is a convenient point oftentimes,—and treat as usual. The less extensive decays may be treated with fillings of cement or gutta-percha,—amalgam seldom or never. The file and chisel may be used for cutting out slight approximal decays. The first and most important requisite is to gain the confidence of the patient. The habit of strict cleanliness must be enjoined upon both the child and the parent. A small badger-hair brush is best for use upon the teeth of a small child. A good powder is prepared according to the following formula:

℞ Prepared chalk,
Precipitated chalk, *aa* ℥ i;
Pulverized orris-root,
White sugar, *aa* ʒ ii;
Pulp of cuttle-fish bone,
Wintergreen and cardamon, *aa* q.s.

Dr. Allport. The great requisite, as has been said, is to gain the child's confidence. I address myself to the child when I make an appointment, and not to the parent. I say, "When can you come?" thus giving the little patient an impression of a confidential arrangement between himself and me. This often has a favorable effect upon the child, for children appreciate anything that looks like deference to their wishes, and they will usually meet you half-way when you treat them as principals, where they might be difficult of management if you made some mysterious arrangement with the parent, only half understood by them. The secret of handling our little patients successfully is to do but little at any one time, avoiding anything like an air of mystery, and always dealing in perfect candor and honesty of intention with them.

A resolution was adopted requiring all who proposed to read papers at the next annual meeting to present said papers to the secretary of the section thirty days before the opening of the session; also, to have persons appointed beforehand to discuss the papers.

After some further discussion of Dr. Betty's paper, the section adjourned to meet in Newport, R. I., in 1889.

PENNSYLVANIA STATE DENTAL SOCIETY.

The Pennsylvania State Dental Society held its annual meeting at the College of Physicians, Thirteenth and Locust streets, Philadelphia, commencing on Tuesday morning, June 5, 1888.

The president, Dr. W. F. Fundenberg, in the chair.

The morning session was taken up by the reading of the minutes of the last meeting and other routine business.

At the afternoon session the president delivered the annual address, in which he alluded to the rapid advance in the profession of dentistry and the important influence dental societies had had in the forwarding of that advance,—the dissemination of new ideas and the discussion of new theories. The establishment of dental colleges had also been the stimulus of a higher education and development in the profession. He endeavored to impress on the members a sense of their duties in regard to the enforcement of the dental law. A better law was needed,—simpler and more restrictive; for the simpler and plainer the law is the more easily it can be enforced. A law requiring every one who shall hereafter engage in the practice of dentistry to be a graduate of a reputable dental school, with registration of his diploma, indorsed by a board appointed by the State society, would be more effective. Such a law would not exclude anyone who is at present in legitimate practice. He closed with a tribute to the good work already done by the Pennsylvania society, and expressed the hope that it would continue its usefulness.

Dr. W. Xavier Sudduth read a paper on the

Trend of Dental Therapeusis.

He took up the consideration of the etiology of decay, and stated that the form of a tooth could only be altered in two ways,—by mechanical abrasion or decalcification; that nine-tenths of the acid found in the mouth was produced by micro-organisms that find their habitat and culture-media in the saliva. Hence the rationale of treatment would lie in destroying these micro-organisms, or at least in inhibiting their development, and such would largely be the nature of dental therapeusis in the future. He stated that we owed the basis of our present knowledge of the etiology of decay to Dr. Miller, and hoped to see him accorded an ovation when he visited this country in August.

Dr. Sudduth presented a long line of antiseptic agents suitable for use in the mouth, many of which had never been presented to the dental profession before, and promised at some future date to present the result of a line of tests regarding their antiseptic values.

Discussion.

Dr. Geo. S. Allan. There can be no question but that dentistry is keeping abreast of the time. In operations, in therapeutics, and mechanics we accept every discovery or invention which will help us in our mission and prosecute with vigor every study that will enable us to make better progress.

This subject of antisepsis is comparatively a new field; and our own members are among the very foremost workers and students in the new science of bacteriology. No one who follows this new study but can see the wonderful influence it will have in our science in the future. There are "bugs" everywhere. Dr. Miller, who has given us so much light from his work in this field by showing us the influence of bacteria upon oral diseases, has pointed out the plan upon which we must work in the prevention of decay of the teeth. Dr. Miller has acknowledged that this science is still in its infancy. The great bulk of bacteria are harmless, but some of them cause poisonous growths as consequences of their being, and these sequelæ cause caries of the teeth. The theory of Dr. Miller accounts for the formation of the cavities of decay. A little pool, so to speak, of lactic acid is developed by the micro-organism and creates the cavity, which then is increased in size indefinitely by giving shelter to the bacteria. Only a few of the many kinds of bacteria have been cultivated and isolated, but, as Dr. Sudduth informed you, real caries has been produced on teeth outside of the mouth, and I have prepared for your inspection two or three hundred specimens of carious dentine, some of which are natural and some artificially produced, and the appearance in both cases is so identical that it is not possible to determine which is which by the microscope.

The way in which this artificial caries is produced by Dr. Miller is as follows: He first procures a pure cultus of the bacteria, and then, having a freshly-extracted tooth, he drops it into a test tube containing the cultus, and allows it to remain there for several weeks. The tooth is found soft, and easily cut, just as if it had been treated by an acid, but there is no possibility of any acid having access to it except that developed from or by the bacteria.

How do we profit in our practice by this knowledge? In a foul mouth the presence of the bacteria is the sole cause of trouble, and the same is true in the case of a tooth having a dead pulp in it. We all dread such cases, for we know that, though there was no trouble before, when we open into this dead tooth and remove the pulp there is almost certain trouble. The reason is that the contents of the pulp-chamber offers the very best cultus for the bacteria, and the surrounding conditions of warmth and moisture are all favorable. So the bacteria obtain ingress and increase, and the trouble

commences. In such a case I sterilize at once the portions exposed, being careful not to force the contents through the foramen; then thoroughly remove every vestige of the pulp possible and use iodol and seal up the cavity. There is no danger of trouble if this careful antiseptic treatment is carried out at the time the tooth is opened. All instruments used to remove a dead pulp should be sterilized afterward, to avoid the possibility of conveying infection. When we expose a pulp we always expect to get into hot water. I think the bacteria multiply upon the part exposed, and this causes all the trouble. I always use an antiseptic in such cases, applying it thoroughly to the exposed pulp, and then sealing up with ether and resin. This is antiseptic surgery, and is successful, and there is no reason why it should not be. Antisepsis is also valuable in the treatment of pyorrhea alveolaris. I first scale off the calcareous deposit as thoroughly as possible, then apply pure sulphuric acid, diluted. I take a stick of orange-wood, shaped properly to allow it to pass around the roots of the teeth, and dip it into the acid solution. Passing it around the teeth in this way softens the tartar and renders it easy to remove. I find no other way to do so well. The acid has such an effect in softening and removing the tartar that it will remove the little scales which are the very beginnings of its deposition, and which cannot possibly be removed by any scaler or other instrument ever made. Then I make an application of a good antiseptic, to rid the locality of germs, and the case is finished.

Dr. W. E. Magill. I recognize in this paper a step in the right direction, as it aims at the prevention rather than the cure of disease. We have limited ourselves too much to the treatment of diseased conditions, and have neglected preventive treatment. The paper says little about constitutional treatment. Dentists have been handicapped by the difficulties in the way of treating their patients constitutionally, and sometimes by the lack of ability to do so. I have for several years been using hydro-naphthol as an antiseptic with good results; have also used sulphuric acid in pyorrhea alveolaris.

Dr. E. C. Kirk. There is one antiseptic not touched upon in the paper or discussions, which possesses great advantages. I allude to chloride of zinc. I used it first at the suggestion of Dr. Essig. I give it in the strength of three grains to one ounce to my patients for a mouth-wash. I had one patient to whom I gave a four-ounce vial of it, with directions to use it twice a day, but did not tell her when to stop using it. The next time I saw her was about a year later, and I found she had had the bottle refilled when it was emptied and had used it every day. The improvement was remarkable. Teeth which had been exceedingly loose were as firm as

possible. This led me to a more extended use of chloride of zinc, and the results have been very satisfactory.

Dr. James Truman. This is a very interesting subject to me,—more so perhaps than any other which will come before us. The dental profession has not paid the attention to the subject which it deserves, and must in the future give it more care.

One danger in these discussions is that we may make mistakes. Dr. Sudduth said the mouth was not the proper place for micro-organisms, but I believe that it is. They are there for a good purpose; we may not know what, but I believe they—some of them at least—have a function in digestion. There are many different micro-organisms in the mouth, and in some cases one kind will destroy another; and again the waste product—excretions—will destroy them. Now, it may be that in this matter of destruction we will go too far. I don't think they are all out of place, nor that it has ever been demonstrated that we would be better off if they were all destroyed.

Dentists are apt to be routinists. They take up one agent and continue it year after year, not caring or not daring to try to find if there is not something better. There have been many antiseptics introduced to the profession, and every dentist should try or test one after another in his practice, and not confine himself to creasote, as he is so apt to do. He will find if he studies the matter that there are substances much more pleasant and at the same time much more effective. I would never use so poisonous a thing as mercuric bichloride as a mouth-wash. I know of no condition of the mouth that requires the use of these agents continuously. Hydro-naphthol is a harmless antiseptic, and I use it every day as a mouth-wash and in my practice, and, if you have trouble with sore mouths caused by rubber plates, have the plates cleansed daily with a solution of hydro-naphthol.

I have very little use for mouth-washes, such as those shown here this afternoon, composed of a mixture of a dozen, more or less, different ingredients. My idea is, first, to know what I want to accomplish by the use of a mouth-wash, and then use the one article best adapted to the purpose. If you will adopt this plan you will have better satisfaction than by using a mixture the effect of which you know nothing about. I never use or recommend tooth-powders,—not because I fear the abrasive effects on the enamel, but because they produce a line of disturbance along the gum, and, if persisted in, will finally cause the loss of teeth perhaps by the way of pyorrhea alveolaris.

I am in accord with Dr. Allan in the use of sulphuric acid for softening and removing the scales of tartar, and after it has been

applied I cover the part with a strong solution of bicarbonate of soda, which neutralizes the acid, and the effervescence which takes place throws up decomposed tissue which it otherwise might be difficult to remove from the socket.

Dr. Allan. The acid used is not the aromatic sulphuric acid, but the pure acid diluted with water. I dissent from what Dr. Truman said about tooth-powder. I have never seen a case of such trouble as he describes from its use, and don't know how teeth can be kept clean without an occasional application of powder to remove the accumulations of such matter as liquid washes will not remove. I have used tooth-powder myself for thirty or forty years constantly.

Pyorrhea alveolaris is always preceded by a deposit of tartar, and this deposit is the cause of the inflammation and consequent flow of pus. The first thing necessary in order to effect a cure is to remove this cause, and it can only be removed effectively by the aid of an acid. No steel instrument will get at it, and you could not know when it was all removed. The acid does this work thoroughly, and I know of no other way to do it.

I spoke of treating exposed pulps antiseptically. This is the one point in what I said which I thought was new and upon which I hoped to hear the views of the gentlemen present.

Dr. Sudduth. It is well known that Dr. Allan and I have different views about pyorrhea alveolaris. The deposit of tartar found on the teeth is not the cause of the inflammation, but the result of it. It is a deposit of lime-salts, and whenever you have inflammation of the tissues surrounding a bone, you are liable to have such deposits. They are frequent in rheumatism and other such diseases. The one fact that this disease is hereditary is sufficient to prove that it is systemic and not local in its character.

Dr. Allan. I would like to know, then, why, when we remove these sequences of the disease, we cure the disease if it is systemic.

Dr. Sudduth. We do not cure it. We seem to cure it for a time, but it is sure to recur. I doubt if we ever saw a case permanently cured.

Dr. C. N. Peirce. I am not prepared to say anything new on the subject of pyorrhea alveolaris. I believe that it is a local expression of a systemic condition, and is largely hereditary. My experience of the progress of pyorrhea is that in every case the first thing is the filling up of the pulp-chamber before there is any deposition of lime-salts around the tooth. I believe that this deposition is a sequence and not a cause of the disease, as bacteria are not the cause but only an accompaniment of caries. They do not cause caries, as they cannot take hold of healthy tooth-tissue; there must be some abnormality, though they are an exciting cause in the progress of the disease. This deposit of lime-salts is not from the saliva, but from

the blood, and to remove it will cause a temporary cure. I take it away as thoroughly as possible with instruments, and then wash out the sockets with sulphuric acid; this, in the strength used, is perfectly harmless, and I don't care to remove it; it is a gentle stimulant to the gum-tissue.

Dr. S. H. Guilford. In regard to the treatment of exposed pulps, one plan put forth by Dr. King several years ago was similar to that advocated by Dr. Allan this afternoon. It was to treat the pulp with a mixture of oxychloride of zinc and carbolic acid, and seal it in. This seems to be an irrational way. To preserve the pulp we must not irritate it, and must not allow it to strangulate itself. When we cover it with a cap which is concave with a space under it, there is a chance that it will strangulate itself, and when we fill with any substance directly over the pulp, it is likely we will force some of the filling through the opening and irritate it. My plan is to cut a disk of letter-paper, and on the under part of the paper to put a solution of Canada balsam, and place this over the pulp; this just covers it, but will not be pressed into the chamber. I have used Japanese bibulous paper and a paste made of sulphate of morphia and carbolic acid. I have had very satisfactory results from both plans; in the latter the carbolic acid possibly acted as a germicide, and was one factor of the success.

Dr. Peirce. I think carbolic acid in such cases is used as a germicide and to prevent the attacks of bacteria. The antiseptic treatment of exposed pulps, though it has not been published before so plainly as Dr. Allan has now placed it before us, has been employed both by myself and others, but to Dr. Allan belongs the credit of first presenting it before a meeting of the profession.

Dr. J. R. C. Ward. I have used the paste of carbolic acid and oxychloride of zinc in the manner described by Dr. Guilford with very excellent results.

Dr. C. V. Kratzer. I have used pure creasote and oil of cloves with marked success, and have also used carbolic acid and oxychloride of zinc.

At the morning session, June 6, Dr. James Truman read a paper entitled

Past and Present Teachings in the Use of Gold Foil.

He said that the peculiar characteristics of the several varieties of gold foil were generally well understood, but there were some points that must be alluded to in order that the subject may be made clear. He defined soft foil as that form possessing a minimum amount of cohesiveness which cannot be increased by heat.

and cohesive foil as that form which, freshly prepared, will cohere without force, and in which the quality of cohesiveness may be increased by heat. It was with strictly soft foil that the profession began its work, and, for at least a half-century prior to 1855, did with it all the work that was done in the stopping of cavities. In 1855 Dr. Arthur called attention to the cohesive property of foil, and since then the profession has been nearly equally divided in its advocacy of one or the other. Notwithstanding that the last thirty years have developed the best operators and the most intelligent system of dentistry that the world has ever seen, the profession has less positiveness as to the proper methods of filling teeth than at any time since the beginning of the century. And yet, in spite of these conflicting views, discussion of the subject seems to have almost ceased, and unless renewed attention is given to it we shall see a retrogression in the filling of teeth. The advocates of soft foil based their operations on certain principles which, while all could perhaps theoretically understand, there were but few equal to the details. The teacher of operative dentistry forty years ago did not deal in general principles, but taught the details of each and every operation. Professor Elisha Townsend, the best operator of his day, spent nearly the entire college session in teaching the preparation of cavities. Harris followed the same method in his "Principles and Practice of Dental Surgery," and the dental world accepted the teachings as practically complete, and thought that no better method of instruction could be devised. True, new forms of cavities were devised at a later day, of more convenient shapes, which facilitated operation somewhat, but without radical change of plan. Professor Townsend's methods came nearer modern practice, inasmuch as he inserted his gold in small pieces, and practically built up the filling lamina by lamina. This method was regarded by the average operator as tedious, and only available by those who could charge fabulous prices. The method then in vogue might not inappropriately be termed "Stopping the Cavity,"—a method at once uncertain and often dangerous to the tooth from the lateral force necessarily exerted in the condensation of the filling; but notwithstanding this and other difficulties, it is not surprising that the results were often more satisfactory than those obtained by present modes. The perfect adaptation of the soft foil to the walls prevented imbibition of fluids at the most vulnerable point, and the enamel was not crazed by the blows of an electric or mechanical mallet. The teaching and the practice of this period were, however, imperfect and incapable of being reduced to a system. The influence of these teachings has reached our day, and threatens to undo the work of the last quarter of a century.

The second period, ushered in by Dr. Arthur, has been a remarkable epoch. Some of us recall the beginnings; the slow approaches to a satisfactory use of cohesive foil; the tedious settlement of processes and appliances. It was not long, however, before chaos yielded to system. The necessity was early recognized for a form of cavity adapted to this variety of gold,—for a better anchorage than had formerly been thought necessary. It was seen that this cohesive gold must be started right; must be solid from the foundation; and so bolt-like holes were drilled into the tissue, which when filled served not only as anchorages, but as points to build upon. Dr. Truman stated that this form of anchorage was first taught by him, and the first published paper describing it was in the *Dental Times* for July, 1865. Although this method met with positive opposition, he claimed that he had never found any serious objection to it to this day. The system became gradually better developed until the introduction of mallet force, which effected a radical change. This was still further increased by the multiplication of force in power mallets, resulting in a systematic application of the condensing force from the introduction of cohesive foil,—a system of filling without perceptible flaw in its arrangement, adapted to the frailest of teeth, and capable of being taught to the dullest comprehension. The result is shown in better operators and more satisfactory operations than under the old method. He claimed that it was the only method worthy of being entitled a "system." It has defects,—one of which had already been hinted at and more elaborately stated in his paper on "Rotation as a Condensing Force," read before the Odontological Society of this city. The doctor stated that his effort now was to arrive at some definite conclusion as to the relative value of the two methods. The first positive blow against the use of cohesive gold was struck by the so-called "New Departurists," and whatever may be said derogatory to their methods, it must be conceded that they led the way in a revolution which threatens to sap the foundations of the practice of filling with gold as it has heretofore been understood. The speaker had nothing but admiration for the "system" of filling with cohesive foil, but was not altogether in love with it as a method of preserving tooth-structure. The best years of his life had been given to the practice and teaching of the use of cohesive foil as a positive system. He recognized, however, some weak points in the system, which had driven many men to the adoption of a middle course, in the use of a combination of soft and cohesive foils. The justification for this combination is based, first, upon rapidity of execution; second, upon better adaptation of soft foil to the cavity-walls; and third, a resulting solidity which, if not equal to a filling of cohesive foil, is

equal to all that is required. When this method is confined within certain limits,—that is, as a lining to the walls and cervical border,—no valid objection can be urged against it. Indeed, it is a question whether it is not the best, as it is certainly the quickest. When rotation (Herbst method) is applied to the adaptation of soft foil, as good results can be obtained as by the use of the power mallet,—not the most perfect mode if solidity be the test of perfection, but, considering the saving of time, with results not unsatisfactory. While not new, it must be regarded as the most practical method. But the two methods must be considered with reference to the office and college training of students. He had no hesitation in saying that the best training for the student in this department of dentistry was in the use of cohesive foil. The student of all periods is a one-idea man, and in his teaching we should begin with the simple, and lead gradually into the complex. By thus teaching a system thoroughly, we enable him to grasp easily variations of practice which have not entered into his instruction. The great mistake in this direction is to "jump" the foundation.

The transition from cohesive gold to soft gold is easy if the use of the former has been well learned; but the change from soft to cohesive, to one who has never acquired dexterity in the latter, is very difficult. It was his opinion that, if American dentistry was to maintain its present supremacy, we must adhere educationally to the cohesive gold system, with its anchorages and perfect welding. If subsequently it is desired to adopt a method less laborious, more remunerative, and with possibly better results in the preservation of tooth-structure, we may adopt soft foil at margins and for linings, and cohesive foil to resist the attrition of mastication.

Discussion.

Dr. C. N. Peirce. My objection to the professor's theory, that cohesive foil is the most desirable for the use of students, is that in filling with cohesive foil they employ the mallet, and do not have to educate their fingers in that nice dexterity which they attain by the practice of soft gold fillings.

The method I have advocated and taught is that we cannot do better than to line the cavity with soft foil, and then to fill with small pellets of cohesive. A danger with students is that they do not make the gold adapt itself properly to the inequalities of the walls of the cavities, but bridge them over, and in consequence the filling will not be solid, but full of little cavities. This is almost unavoidable with the use of cohesive gold alone in the filling, but by lining the cavities and the margins with soft foil there is an

assurance of a tight cavity, and the enamel is not liable to be split in adapting this lining.

Dr. S. H. Guilford. I fear there will be a confusion of tongues. Our definitions of soft and cohesive gold do not agree. Drs. Truman and Peirce did not speak of these foils as I would. Cohesive gold is pure gold in that condition in which two particles brought into contact will adhere. If of non-cohesive gold they will not cohere. There are but two makes that will answer to these definitions. Intermediate between these two you have soft gold, very soft in its working, with slight cohesion between the particles upon pressure. The advantages of soft foil are that it will stay where it is placed and has no tendency to curl up or spread under the instrument. The objection is that it cannot be used alone except in simple cavities.

When cohesive gold was introduced it was used without judgment, and its limitations were not found out till experience demonstrated them. Dr. Truman called our attention to one of the qualities which render it difficult to work with alone,—the balling of the gold when it is inserted. This quality makes it undesirable for lining cavities. If we take that preparation of gold which is called semi-cohesive, and which, as it comes from the manufacturer, possesses the good qualities of both soft and cohesive foil, we have a most admirable material for tooth-filling. In the condition in which it is procured for use it is suited for lining the cavity and filling around the margin, as it will not ball up nor curl under pressure from the instrument, and when we come to the surface and want it more cohesive, we simply warm it and make it as cohesive as we like.

To fill a cavity properly we must have something that will fit closely to the margins and so seal them; then we must fill the cavity so that the gold in the interior will not change its shape, and every particle must stay where we put it. All this can be obtained from this semi-cohesive foil. All claimed for non-cohesive foil for margin adaptation can be had in the semi-cohesive, and if I can get as good results in using one kind of gold, I prefer it to using two kinds in the same operation.

In regard to the teaching of students,—at first I thought it best that students should be taught the use of every material. I soon found that I could not use every material equally well myself, so I gave them the theoretical part of each operation, and got such practitioners as excelled to demonstrate the different materials and methods to them. But time is too short to teach all methods thoroughly, so now I think it better to be thorough in what I consider the best way and give a general teaching only in the others.

Dr. W. E. Magill. Dr. Truman alluded to influences as retroactive in the profession to-day. I know there is a reaction from cohesive gold,—one of those rebounds from one extreme which are usual. The discovery of the qualities of cohesive foil coming at a time of financial plenty, the profession was stimulated to rush to the very extreme in operations and especially in what are called contour fillings. This cohesive gold had wonderful qualities, and enabled us to make great progress; we went too far, and the reaction is natural. At this day many fillings stand as monuments of the skill attained by the profession in the use of soft gold, but the difficulty of its use led us to prefer the cohesive foil, and to make the extensive and expensive operations in contouring. The reaction is two-fold,—with the profession and also with the people. It is really a reaction and not a retrograde movement.

I consider that Dr. Truman is correct in his definitions of soft and cohesive foil. When you use soft foil you depend upon its condensation, and get from this condensation a binding against the side of the cavity to make your filling secure and perfect. With the cohesive foil, however, you build up perfectly from the beginning; every part is secure when it is put in place, and does not depend upon the binding against the margin of the cavity for its retention; indeed, you can safely build away beyond the margin if you desire. Many say that as a tooth-saver non-cohesive is better than cohesive foil. This is true, but the reason is that the average dentist does more careful work with the non-cohesive than with the cohesive, the difference being due to the quality of the work and not to the material.

There are men in this country of whom it is said that a mouth which has been under their care, and which they pronounce finished, has no need of anything more being done; they work so conscientiously and so skillfully that no one could find anything lacking. Their chosen material is cohesive foil, and in right hands it is the *ne plus ultra* of filling-materials.

Dr. J. S. Smith. I remember the introduction of the method of filling with cohesive gold and retaining points. I have found the theory a good one, and it has enabled me to do work of which I am not ashamed. I know that in some cases years have demonstrated that the work is not up to the theory, but for all that the theory is right: the difficulty is that we do not always carry it out right. Cohesive gold foil used along the margins will produce failure, on account of leakage. My practice is to use soft gold in retaining points and undercuts and at all margins; then I take semi-cohesive or cohesive and finish the operation. Sometimes I resort to the use of tin, and I am not ashamed of this either, for tin has some qualities

as a filling-material not to be found elsewhere. I think it is sometimes a real advantage to use continually the same make of gold. By following this plan one always knows how the material will work, and it will be much easier to obtain good results than by frequent changes. I have used the same brand of gold for fourteen years, and think it the better plan.

Dr. H. Gerhart. The remarks of Dr. Magill are just. Too many of the younger operators have forgotten that the object of dental operations is not ornamentation, but conservation. If you could find a community in which the dentists had confined themselves to the use of one kind of gold, and another where they had confined themselves to the use of another kind, and then note the number of artificial teeth worn, you could form a correct estimate of the success attending the different fillings, and the usefulness of the different materials. I know of one such community in which all the operators have used soft gold, and I feel sure less artificial teeth are worn there than in any community where the general practice has been to use cohesive gold.

Dr. C. A. Kingsbury. If there is any virtue in using a single make of foil, I have to say that I used Abbey's for my first filling and am using it still. I have tried other makes to a considerable extent, yet have not found any that suited me better.

It is better to practice eclectic dentistry. In many cases cohesive gold is best; in others soft gold will enable the operator to do better, but whatever the material I think it cannot be doubted that in proportion as the cavity is filled, so that it will not leak or change, the better the filling will be.

I do not like to depend too much upon anchorage points, but like to shape the cavity so that it will retain the filling by reason of the shape of the cavity and of the filling. I do not approve very much of the use of anchorage points. I have seen cases where the pulp has been impinged upon by the anchorage point, and I discourage their use. I do not champion the use of gold in all cases over all other filling-materials, though in cases where it is called for it is the *ne plus ultra* of all materials, and where I can use it I always prefer it to any other. We have more dentists who can do good work with soft than with cohesive foil, and I think that if its use were more universal the people would be better served.

Dr. H. C. Register. More teeth have been saved by other materials than by gold. If the cavity to be filled were in a dead substance, then the operation would be simply a mechanical one; but the teeth are living, and this makes it a very different matter. In preparing cavities we do not as a rule sufficiently consider the age or density of the tooth, and are apt to fall into one method and

use it in all cases. The first object of the operator should be to make a cavity that will hold the filling, and to do this it should not be made in such shape as to make impossible the work of repair, or deposition of reparative dentine. The best shape, then, for the cavity is always the wedge shape, for in such a cavity the filling is not placed so as to cut off the fibrillæ, and the process of repair is set up in every part of the wall of the cavity. It is almost impossible to use harsh gold in contact with dentine without causing trouble. The dentine is so crushed and bruised that the process of repair cannot be set up. By the use of soft foil, however, the process is set up and a cure is effected, by the reaction in the dentine where it is in contact with the gold, which causes a deposit of secondary dentine, and the tooth is really cured.

As to retaining-points, a very small retaining-point placed in the grinding-surface will hold any filling which is properly inserted. I think gold should be placed in a cavity as a plastic material. The mallet is in many hands used too roughly. Too much pounding breaks down the dentine, and may in some cases even set up irritation around the root.

The only difference I find between cohesive gold and soft gold treated to make it cohesive, is, that the latter is liable to become discolored. I have found that all gold that I have used can be rendered cohesive by annealing, unless it has some alloy.

Dr. E. C. Kirk. The terms "soft" and "hard" have been used here as if they meant the same in cohesive and non-cohesive foils. This is not so. Nature always does the same thing under the same condition; there is no variation except some condition is changed. This is an invariable truth. We get books of foil from the manufacturers called absolutely pure, and yet said to be soft, semi-cohesive, and cohesive. This is absurd, as pure gold is always cohesive.

When writing my article for the "American System of Dentistry," I had books of foil from the different makers tested at the assayer's office of the United States Mint, with quite astonishing results. I found that Abbey's soft foil contained two parts in one thousand of impurity. I am not sure this was an integral impurity; it may have been only a surface impurity; but it certainly was not volatile, for every sheet was heated before being assayed sufficiently to burn off anything in the way of dust, or oil, or ammonia. I found that Rowand's foil approached nearest to purity, while the S. S. White Quarter-Century and Wolrab's German foil were very near pure, having less than one part in one thousand of impurity. It was a wonder to me how foil could be made so pure. In an impure gold the effects of the impurity will depend on the nature of it. If it should consist of one of the base metals, it would be different from

the effect of one of the non-oxidizing metals. With a gold with the least admixture of one of the base metals, it would be quite impossible for an operator to make a tight filling. In order to prove the test made by the Mint, I had them make for me some certainly pure gold. I then had this made into foil, and put some of it into the book of a firm and gave it to the assayer. He reported that it was absolutely pure, and the only specimen I had given him that was so.

(To be continued.)

At a special session on Wednesday evening, June 6, at Justi's Hall, the following officers were elected for the ensuing year:

H. C. Register, president; J. C. M. Hamilton, first vice-president; W. H. Fundenberg, second vice-president; Jos. R. C. Ward, recording secretary; C. V. Kratzer, assistant secretary; P. K. Filbert, corresponding secretary; L. Ashley Faught, treasurer; Alonzo Boice, G. L. Robb, J. S. Goshorn, W. H. Trueman, and S. H. Guilford, board of censors; E. C. Kirk, C. S. Beck, and W. E. Van Orsdel, board of examiners.

The next meeting was appointed to be held at Cresson Springs, commencing on the last Tuesday in July, 1889.

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

The regular meeting of the Odontological Society of Pennsylvania was held at the northwest corner of Thirteenth and Arch streets, Philadelphia, on Saturday evening, April 7, 1888.

President Edward C. Kirk in the chair.

Clinic Report.

The clinic was held at 2.30 P.M. at the depot of The S. S. White Dental Manufacturing Co., Chestnut street, corner of Twelfth. Dr. A. G. Bennett demonstrated by the use of models his method of adapting the Bing tooth to bridge-work, and showed a new and simple method of taking difficult partial impressions. When used in this way, the Bing tooth as now made must be modified by grinding off the convexity of the palatal surface, and cutting the pins quite short; then a little more than half the tooth is encased by a thin backing of pure gold. Four teeth can be used in a space, though not more than three are advised. They are supported in a bridge partly by their pins, partly by their shape, *but chiefly by the thickness of the gold solder on the palatal and approximal surfaces.* As just stated, the palatal surface must be freely removed, so that when restored with gold the tooth will not be too bulky. Such a bridge has ample strength unless the teeth are checked on their approxi-

mal surfaces. Checking is easily prevented by ordinary care. . The new method of taking partial impressions is especially adapted to dovetail interdental spaces requiring one or two teeth, such spaces being the most difficult to manage by other methods. This method consists in first fitting and cementing the teeth accurately and correctly in the spaces, like so many artificial crowns, and then taking the impression. When there are palatal undercuts, as in the case shown, the impression is removed in sections, the cup first being oiled and a blade of wax extending back through the center to divide the palatal portion in two parts. The rim is removed by cutting a groove around the middle of the ridge, the palatal parts next dislodged, and then the teeth are removed, both these and the section of plaster being accurately adjusted in the cup.

[Dr. W. G. A. Bonwill read a paper entitled "The Philosophy of Eating and Drinking and Its Practical Bearing upon our Physical, Moral, and Spiritual Nature," which was followed by an interesting discussion. The great length of the paper, however, precludes its publication, and the discussion, naturally following the lead of the essay, would not be intelligible without it.—Ed. DENTAL COSMOS.]

A regular meeting of the society was held at the same place on Saturday evening, May 7, 1888.

President Kirk in the chair.

E. H. Neall, D.D.S., read a paper entitled

HINTS WITH REGARD TO THE PRESERVATION OF THE TEETH,

of which the following is an abstract:

When viewed from a professional stand-point, no subject is of greater importance to the dentist than the preservation of the natural teeth. It is true that it is now and then presented to the public through our dental journals, and is taught in the office by all careful dentists; yet we know from daily observation that not enough attention has been paid to these teachings by those for whose benefit they have been given. The heads of families especially should be made to realize their importance.

In these days of heroic operations upon the mouth and teeth, necessitating great endurance upon the part of the patient, as in cases of implantation and some forms of bridge-work, topics which take up so large a portion of our dental journals and society discussions, it would be well to consider how much we can obviate such difficulties by teaching hygienic dentistry to our patients, impressing upon them that by the preservation of the teeth they not only retain the

natural expression of the face and tone of voice, but assist largely in promoting the health and strength of the entire organism; that proper mastication of the food is necessary to maintenance of health.

An examination of the skulls of mummies shows that decay of the teeth among the ancient Egyptians was not so frequent as in later times. Historians tell us that the early Egyptians gave instructions in schools of medicine upon the cure of diseases of the teeth, and recently several artificial dentures have been found in Etruscan tombs dating from about 600 B.C., which are preserved in the museum at Corneto Tarquinius, near Civita Vecchia. The teeth were carved from the teeth of some animal, and secured to the adjoining natural teeth by rings of soft gold, showing that the ancients appreciated the value of the natural teeth and endeavored to substitute artificial ones when it became necessary. Whether from climatic influences, from a departure from primitive habits to luxurious ones, or still worse from neglect, decay of the teeth appears to be universal, and sound and perfect teeth the exception.

Considering the enormous number of teeth yearly sacrificed for relief from pain,—estimated by some as high as twenty millions,—the question of what can be done to arrest this wholesale loss presents itself for our serious consideration.

Although fully believing that a great change should take place in the selection and preparation of our food, particularly in that designed for children, and recognizing our duty to warn our patients against the ill effects of extremes of temperature in articles of daily consumption as well as to advise the frequent use of such foods as are known to contain the earthy salts, yet most people, we are sure, would not give up their old habits and customs, and so we must accept the conditions as we find them.

Decay of the teeth is caused in the great majority of cases by the chemical action of acids generated in decomposed food between and around the teeth,—micro-organisms assisting in the destructive process. As many patients are negligent, we should impress upon their minds the necessity of carefully and conscientiously using the tooth-brush, waxed floss silk, the toothpick, powder, etc., giving as careful attention to the lingual and palatal surfaces as to the lateral and buccal. On the other hand, they should be cautioned against too frequent brushing, against the use of too stiff brushes and improper dentifrices. I usually recommend a powder composed of precipitated chalk with half its quantity of carbonate of magnesia, made agreeable in taste and odor, to be used two or three times a week. In cases of diseased and ulcerated gums, astringent gargles will assist in restoring the relaxed tissues to a healthy condition.

Other causes of decay of the teeth—predisposing or exciting—are irregularity in formation or arrangement, salivary calculus, and vitiated saliva, to which may be added the mineral and vegetable acids prescribed as systemic remedies and taken without proper precautions.

Irregularity—a frequent cause of inflammation of the mucous membrane and of decay of the teeth—often requires all our skill and patience for its correction. Fortunately, we seldom find much irregularity of the deciduous teeth. The most important period is that which intervenes between the eruption of the temporary set and the completion of the permanent set, and much will be gained if the mouths of children are frequently examined between the sixth and the thirteenth years. In view of the difficulty of keeping teeth clean which are irregular or over-crowded, extraction of two of the posterior teeth in each jaw is in many cases advisable; indeed, the average American mouth would be better by such procedure.

Among the exciting causes of decay, salivary calculus holds an important place and deserves more attention than is usually given to it.

The subject of the changes to which the secretions of the mouth are liable is also a very interesting one to the dentist. The fluids of the mouth are so changed from their normal condition when the digestive organs do not perform their functions properly that we should be prepared to intelligently advise when the patient is not under medical treatment.

Would it not be worthy of this society to endeavor to popularize this branch of dental science, either by publishing short articles in the daily papers on subjects pertaining to dental hygiene, or by utilizing a portion of the journal fund in the purchase for gratuitous distribution to our patients of that valuable little work, "The Mouth and the Teeth"?

Discussion.

Dr. Faught. To too many it is a creed that failures in tooth-fillings must be and always are due to carelessness in operation. The truth is that the preservation of the teeth depends more upon the care they receive from the patient than upon the services of the dentist. Without stopping to discuss the merits of the two creeds at present before the profession, that "failure in operations is mainly due to defective manipulation," and that "failure in operations is mainly due to incompatibility of filling-material with tooth-bone," I desire to enumerate another, that failure in operations and tooth-loss are mainly due to the lack of oral hygiene.

I wish to call your attention to a preparation by Wyeth & Co.,

which they are about to place upon the market. It is put up in the form of tablets prepared of antiseptics and alkaline substances, practically the same as Listerine, which is good but too expensive for our use, while these tablets are less expensive and very convenient. They were suggested by Dr. Seiler, for use in the diseases of the nose and throat, and are used in solution of one tablet to about half a glass of water, and this solution will be found to be a very pleasant and effective mouth-wash; its alkaline qualities neutralizing the acids which would attack the teeth. It is also effective in destroying bad odors arising from decay of the teeth, disturbance of the digestion or from food,—even the smell of onions being entirely destroyed by its use. It has no unpleasant taste and leaves no burning sensation; on the contrary, it is bland and leaves a delightful sense of coolness in the mouth.

Dr. Sudduth. There is no doubt that this preparation is an effective deodorizer, but we cannot be sure whether it is a true disinfectant or germicide. With the apparatus the society proposes to place in my hands, I will be able to test this and learn whether it is or not; and this is one way the apparatus will be of positive benefit to every member, not only of this society but of the profession.

Dr. James Truman. The subject we have had brought before us this evening is perhaps one of the most important that could claim our attention. The hygiene of the oral cavity is a matter that should interest every one, professional and lay. The therapeutic treatment of the mouth as a prophylactic in the prevention of caries has only recently occupied the thought of the profession or been made the subject of careful investigation. The subject of the origin of caries is one too large to be disposed of in one evening's discussion; but we all understand, in degree, the necessity of antiseptic treatment in the prevention of those low forms of life that have such an important influence on nearly all the diseases of the oral cavity, but especially on caries. The prevention of disease is to be, I am satisfied, not only the principal work of the medical man in the future, but will claim the largest share of the attention of the dentist in the years to come. The masses have too long been under the impression that the dentist is to do the work that belongs to each and every individual to do. The people must be taught the value of antisepsis; that in proportion as they keep the mouth pure will the whole organism be more free from disease.

In the use of antiseptics we should have a distinct idea of what we propose to accomplish, and then select the proper means to attain our end. I cannot see the benefit to be derived from complicated prescriptions. Agents are often combined without any apparent thought whether each will aid or antagonize the other. The

dentist of to-day should be qualified to meet all these demands upon his intelligence and to comprehend the various lesions and be able to select the appropriate remedy.

In my view the excessive use of tooth-powders, so much indulged in, is exceedingly hurtful: not that they injure the enamel, for they do not; but that they are a serious injury to the gingival border and dispose the part to future disturbance. The derangement of this border is clearly apparent on the teeth of those most scrupulously clean, and must be ascribed to the injudicious use of the tooth-brush and powder. Both of these have their place. The advantages of powder may all be gained by the use of a soft stick and finely levigated pumice used on the enamel when something more than a brush is needed. If this mode be combined with a good antiseptic, as betanaphthol,—hydro-naphthol reduced to a non-irritating solution,—or thymol equally reduced, they will inhibit the development of micro-organisms and keep the margins of the gums free from inflammation, and, as Dr. Black has demonstrated, rubber plates from irritating the mucous membrane.

The subject of fillings brings to my mind that I recently received a letter from a friend, Dr. Henriette Hirschfeld, of Berlin, Germany, in regard to the use of tin and gold in combination. This is a subject that has been more or less discussed for years, but has not met with much favor on account of the resulting color, being nearly as bad as copper amalgam. Like the latter, its value has never, to my knowledge, been denied. Dr. Hirschfeld has endeavored to overcome this, and says it is accomplished by placing one leaf of tin foil between two sheets of gold. This is not quite so easily worked as the old mode,—one sheet of gold between two of tin,—but there is no resulting discoloration.

Dr. Thomas. There was one suggestion in Dr. Neall's paper which struck me favorably; that was, that it would be well to make the people acquainted with the facts of dental hygiene. I have made a computation that of the inhabitants of our large cities not more than ten per cent. have a regular dentist, and give even tolerable care to their teeth; while in the country not a greater proportion than two per cent. ever visit the dentist's office unless under the stress of severe toothache, and then only for the purpose of having the offending tooth extracted. In no other way could we benefit the people more than by circulating knowledge on this subject.

Dr. Kirk. I cannot agree with Dr. Truman as to the uselessness of tooth-powders. I have always considered them valuable in cleansing the teeth, not by reason of their chemical action alone, but because of their detersive quality. You cannot remove the in-

spissated mucus or food débris which clings about the roots of the teeth and upon their surfaces by simply using the brush with water. I find tooth-powder aids in removing these deposits upon the same principle that sand is used as a detergent in scouring floors. I believe that the addition of a suitable antiseptic to tooth-powders would be valuable, though but few of the so-called antiseptic agents are adapted for use in this way. I have been experimenting with the silico-fluoride of sodium as an ingredient of tooth-powders for its antiseptic qualities. It has been stated that its germicide properties are second only to those possessed by corrosive sublimate. It is a perfectly bland, non-irritant, non-poisonous material, without color, and if its antiseptic qualities are such as are claimed for it, it would seem to be particularly adapted for an ingredient of tooth-powder, with which it is entirely compatible. I would be glad if the gentlemen present would take up the investigation of this substance and test its value. I have used it in the treatment of putrescent pulp-cavities with good results.

I wish also to speak of the copper amalgams. In the list of filling-materials which Dr. Miller, of Berlin, experimented with, with a view of ascertaining which, if any of them, possessed antiseptic or antiferment properties, the result of which investigations is published in the "American System of Dentistry," you will see that this is the only filling-material of the entire list which has any antiseptic quality whatever. It has not been determined exactly to what this antiseptic quality is due, but it has been proven that it exists, for not only would the filling, but also portions of the dentine which had become discolored through imbibition of the copper salts from the copper amalgam, completely resist fermentation in beef solutions,—a property which is not shared by any other filling-material known. It has been stated that "this alloy discolors the tooth-structure." I have not found this to be the case. The surface of the filling becomes, in time, intensely black, but I have yet to see the first case of discoloration of tooth-structure where this material was used.

There is much difference in copper amalgams. Some samples are improperly prepared, and seem to be filled with a dirty brown substance, which is probably a sub-oxide of copper. A good copper amalgam should work up clean and bright, and not soil the hands to the slightest extent in mixing. A dirty copper amalgam should be treated with dilute sulphuric acid or strong ammonia water to thoroughly remove any oxide present. It is probably owing to the presence of this copper oxide that the discoloration of dentine alluded to by Miller and others who have used this material is due. It is an invaluable filling-material in certain positions, and in that class of teeth of loose structure so difficult to save by any means. Its value

depends upon its antiseptic quality and absolute unchangeability as to form. Fletcher says of it that "if it is dissolved in acid its solution is intensely poisonous, but that it is inert in the fluids of the mouth." It seems to be a stable alloy, a definite chemical compound, consisting approximately of copper twenty-five per cent., and mercury seventy-five per cent., and does not seem to be acted upon by the fluids of the mouth, except superficially, the dark coating alluded to seeming to protect the body of the alloy from further action.

Dr. Sudduth. Do you know whether it is soluble in lactic acid? for this is the acid usually found in the mouth, the acid which causes the decay of the teeth.

Dr. Kirk. I have not tested it with lactic acid.

Dr. Tees. I think we ought to do everything in our power to teach the people and impress upon them the advantages of the proper care of the teeth, and, as Dr. Neall suggests, an important aid is the circulation of Dr. White's little book upon "The Mouth and the Teeth." They should be taught to keep the teeth and mouth perfectly clean. Nothing makes me so well satisfied with my profession as the semi-annual visits of refined people whose mouths are clean and whose fillings look as if they had just been inserted; while nothing so discourages me as the tri-annual visits of otherwise well-bred people, tobacco-users and others, with dirty teeth and fillings, and decay taking place around them. I think also it would be well to circulate the small pamphlet which Dr. Faught gave us at the last meeting, in which he asserts that the failure of fillings is due in a great measure to the lack of cleanliness. There is a tribe in Africa whose children chew the food for the old men who have lost their teeth. The other day a refined young mother brought to me her little boy, about four years of age, to have a small cavity in a molar filled. She personally superintended the cleaning of his teeth, which was evidently done two or three times a day. The teeth were perfectly clean with but this one cavity, and the gums were pink and healthy. If I had to have some one chew my food for me, that is the child I would want to do it.

The following officers were elected to serve during the ensuing year: E. C. Kirk, president; C. R. Jefferis, vice-president; Ambler Tees, recording secretary; H. K. Leech, corresponding secretary; E. H. Neall, treasurer; J. D. Thomas, librarian; James Truman, L. Ashley Faught, and D. N. McQuillen, executive committee.

AMBLER TEES, D.D.S., *Recording Secretary.*

FLORIDA STATE DENTAL ASSOCIATION.

The Florida State Dental Association met in St. Augustine June 25, 1888.

Dr. J. N. Jones, president, delivered an address upon the value of organization, of dental associations, and of dental legislation.

Dr. C. F. Kemp presented a report on the Progress of Dental Education—a historical resumé of dental society organizations, of dental colleges, of State dental examining boards, and the formation of the National Association of these Boards, and of the National Association of Dental Faculties; discussing preliminary examinations, graded courses of instruction, intermediate examinations, and dental periodical and text-book literature.

Dr. J. W. Peete emphasized the need of preliminary education, and the adoption of a higher standard of educational qualification.

Dr. W. E. Driscoll read a paper entitled "Dental Education Ends only with Professional Life," in which was discussed the healthful influence of the enactment of State laws regulating the practice of dentistry, the necessity for greater discrimination in the selection of office students, and the moral obligation assumed by those who receive students to qualify themselves for the position of preceptors. He also urged the necessity of continual professional education by the perusal of dental journals and attendance upon meetings of society organizations.

Dr. Driscoll also read a paper under the title of "Fourteen Years' Recorded Experience with Alloy Fillings." He claimed that he had kept a careful record of his alloy fillings for fourteen years, and that the result of his observations was that in numerous instances he found fillings consisting of an alloy of tin and silver only failing utterly, while in the same mouths fillings composed of a platinum and gold alloy remained perfect. He said that he could not recall a single exception to the rule that platinum and gold alloys make far more permanent fillings than tin and silver in any proportions, and urged upon dentists the necessity to "observe, compare, reflect, and record" their experience in this way. Other conclusions to which he had arrived were that a cavity will not decay under a cement filling (if the cavity has been well prepared) while the cement remains in the cavity. It is his custom in filling frail teeth whose anchorage is doubtful to line the cavity with a very sticky cement, and introduce the first block of alloy while the cement is still plastic and will adhere to it, thus improving the anchorage, strengthening the weak walls, preventing discoloration and thermal shocks, and making a water-tight filling. In also enables one to condense the alloy in a sensitive tooth far more solidly than could

be done without the cement. To prevent the sliding of an alloy filling on the bottom of a cavity, he coats the cavity with copal or other varnish, and makes the first block of alloy with as little mercury as possible, carefully rubbing it firmly against every portion of the cavity. In finishing, he lays folds of bibulous paper or a strip of muslin on the surface of the filling and burnishes over it. In preparing a cavity for alloy, he polishes the cavity-edges as carefully as if it were to be filled with gold. After the alloy has become hard it should be carefully dressed smooth, but hard burnishing of the edges should be avoided.

The following officers were elected for the ensuing year: B. T. Cowart, president; Chas. P. Carver, first vice-president; L. F. Frink, second vice-president; J. W. Peete, secretary, Jacksonville (summer address, 313 Main street, Memphis, Tenn.); J. O. Haynes, treasurer; James Chace, L. F. Frink, W. H. Rosenberg, Duff Post, and F. E. Buck, executive committee.

COLORADO STATE DENTAL ASSOCIATION.

THE second annual meeting of the Colorado State Dental Association was held at Denver, June 5 to 7, 1888.

The following officers were elected for the ensuing year: J. W. Grannis, president; P. T. Smith, first vice-president; J. H. Beals, second vice-president; H. P. Kelley, recording secretary and treasurer; J. N. Chipley, corresponding secretary.

The next meeting will be held at Denver, commencing June 5, 1889.

H. P. KELLEY, *Rec. Secretary*, Denver, Col.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

THE Dental Society of the State of New York held its regular annual meeting at Albany, N. Y., May 9 and 10, 1888. The following officers were elected for the ensuing year:

J. Edw. Line, president; C. F. Rich, vice-president; Myron D. Jewell, secretary; H. C. Mirick, treasurer; G. L. Curtis, correspondent. The board of censors is composed of the following: William Carr, William Jarvie, S. D. French, W. H. Colgrove, S. B. Palmer, A. M. Holmes, Frank French, and A. P. Southwick.

At the close of the meeting the twentieth anniversary of the society was celebrated by a banquet.

G. L. CURTIS, *Correspondent*, Syracuse, N. Y.

NORTH CAROLINA STATE DENTAL ASSOCIATION.

The fourteenth annual meeting of the North Carolina State Dental Association convened in Raleigh, June 12, 1888. It was the largest gathering in the history of the society.

The following were elected officers for the ensuing year: V. E. Turner, president; C. A. Rominger, first vice-president; F. S. Harris, second vice-president; J. W. Hunter, treasurer; H. C. Herring, secretary.

H. C. Herring, *Secretary*, Concord, N. C.

EASTERN IOWA DENTAL SOCIETY.

The Eastern Iowa Dental Society held its first meeting in the office of Dr. Caldwell, at Marion, Iowa, June 25, 1888.

The following officers were elected for the ensuing year: Gustavus North, president; F. R. Ross, vice-president; W. G. Clark, treasurer; J. W. Caldwell, secretary.

The next meeting will be held in Cedar Rapids, September 10, 1888. Dentists are cordially invited to be present.

J. W. Caldwell, *Secretary*, Marion, Iowa.

JOINT MEETING OF THE AMERICAN AND SOUTHERN DENTAL ASSOCIATIONS.

A joint meeting of the American and Southern Dental Associations—the twenty-eighth of the former and the twentieth of the latter—will be held at Louisville, Ky., commencing August 28, 1888.

We are requested to announce that the Trunk Line Passenger Association, the Southern Passenger Association, and the Central Traffic Association have agreed to sell tickets on the "Certificate Plan" to the joint meeting, at fare and a third for the round trip.

By the "Certificate Plan," each person availing himself of the concession procures a blank certificate and pays full first-class fare going to the meeting, presenting the certificate to the agent who sells him the ticket for his signature to that effect. During the meeting he gets the certificate indorsed by the person assigned to that duty. This indorsed certificate entitles him to a return ticket over the route by which he came at one-third regular fare, when presented to the proper ticket agent within three days after the close of the meeting. The certificates are not transferable. Blank

certificates can be procured from Dr. Geo. H. Cushing, secretary of the American Association, 96 State street, Chicago. Those who expect to go should apply at once, so that a sufficient number of certificates can be ordered from the associations. For obvious reasons the certificates cannot be issued until within about a week of the date of the meeting.

The Texas Traffic Association sells summer excursion tickets to Louisville over all lines it controls at fare and a third. These tickets are good until October 31.

The Chesapeake and Ohio Railroad will sell tickets from Washington City, Richmond, Charlottesville, Staunton, and all points on the line at one fare for the round trip. These tickets will be on sale August 24 to 26, and will be good to return till September 10.

The Committee of Arrangements also announce that they have secured the following rates at the hotels: Louisville Hotel, $2.50 to $3.00 a day; Galt House, $2 50 to $4.00 a day, the higher price for rooms with extra accommodations, as parlor, bath-room, etc., attached; Fifth Avenue Hotel, $1.75 a day; Phœnix Hotel, $2.00 a day; Alexander's Hotel, $2.00 a day; Rufer's Hotel (European plan), $1.00 a day for room.

For any further information address Dr. Charles E. Dunn, chairman Committee of Arrangements, 592 Second street, Louisville, Ky.

NATIONAL ASSOCIATION OF DENTAL FACULTIES.

The fifth annual meeting of the National Association of Dental Faculties will be held at the Galt House, Louisville, Ky., on Monday, August 27, 1888, at 9 A.M.

In order that this meeting may be dispatched before the Southern and American Dental Associations get to work, it is hoped that the entire membership may be represented promptly at the hour indicated.

A. O. Hunt, *President*, Iowa City, Iowa.
Junius E. Cravens, *Secretary*, Indianapolis, Ind.

VIRGINIA STATE DENTAL ASSOCIATION.

The nineteenth annual meeting of the Virginia State Dental Association will be held in the High School Building, Staunton, Va., beginning on Wednesday, August 22, 1888, and continuing three or four days.

The State Board of Dental Examiners will hold a meeting at the same place on Thursday, August 23.

W. W. H. Thackston, *President*, Farmville, Va.

DENTAL COLLEGE COMMENCEMENTS.

HARVARD UNIVERSITY—DENTAL DEPARTMENT.

THE annual commencement of the Dental Department of Harvard University was held, in connection with those of the other schools of that institution, at Cambridge, Mass., June 27, 1888.

The number of matriculates for the session was twenty-nine.

The degree of D.M.D. (*dentariæ medicinæ doctor*) was conferred on the following dental graduates, by Charles William Eliot, president of the University:

NAME.	COUNTRY.	NAME.	COUNTRY.
George P. Geist	Germany.	Henry A. Kelley	Massachusetts.
Frederick P. Graves	Maine.	Thomas G. Read, L.D.S.	England.
Ellis P. Holmes	Massachusetts.	Frederick A. Stevenson	Canada.

CENTRAL UNIVERSITY OF KENTUCKY—DENTAL DEPARTMENT.

THE second annual commencement of the Dental Department of the Central University of Kentucky (Louisville College of Dentistry) was held at the Masonic Temple, Louisville, Ky., on Wednesday evening, June 13, 1888.

The class valedictory was delivered by J. Leonard Harris, D.D.S., and the address on behalf of the faculties of medicine and dentistry by Prof. Dudley S. Reynolds, A.M., M.D.

The number of matriculates for the session was twenty-one.

The degree of D.D.S. was conferred on the following graduates by Rev. L. H. Blanton, D.D., chancellor of the University:

NAME.	COUNTRY.
J. B. Alexander	Kentucky.
R. E. L. Barlow	Kentucky.
John L. Harris	Kentucky.
C. W. Bryant	British Honduras.

UNIVERSITY OF MICHIGAN—DENTAL DEPARTMENT.

THE annual commencement exercises of the Dental Department of the University of Michigan were held in University Hall, Ann Arbor, Mich., on Thursday, June 28, 1888.

On dental class day, June 26, there was an address by President Thomas S. Maxwell; a poem by William O. Randall, D.D.S.; class history by Frank H. Essig, D.D.S.; an oration by Egbert T. Loeffler, D.D.S., and a prophecy by Miss Harriette Parkes Brierley, D.D.S.

The number of matriculates for the session was one hundred and three.

On commencement day, June 28, after an oration by Thomas C. Chamberlain, LL.D., president of the University of Wisconsin, the following members of the dental class received the degree of D.D.S:

NAME.	STATE.	NAME.	STATE.
Horace A. Benson	Ohio.	Irvin Meyers	Michigan.
Clarence W. Berry	Michigan.	Rudolph P. Nagle	Wisconsin.
William T. Binzley	Pennsylvania.	Harry C. Nickels	Michigan.
Harriette P. Brierley	England.	Charles W. Nutting	Minnesota.
Elwyn Butts	Iowa.	Homer E. Parshall	Michigan.
Rollin E. Drake	Michigan.	William O. Randall	Michigan.
William F. Dunlop	Michigan.	Henry C. Raymond	England.
Frank H. Essig	Michigan.	Theckla S. Reuter	Wisconsin.
William B. Flynn	Michigan.	Henry W. Riser	Iowa.
Sherman M. Fowler	Michigan.	Martha J. Robinson	Ohio.
Jeronimo J. Garcia	U. S. of Col.	Henry M. Seybold	Michigan.
Arthur N. Hart	Michigan.	Michael C. Sheehan	Michigan.
Elmer B. Hause	Michigan.	Lucius C. Smith	Michigan.
Oliver W. Huff	Kansas.	Sherman M. Stauffer	Illinois.
Egbert T. Loeffler	Michigan.	Martin D. Vandenberg	Michigan.
Otto Marx	Ohio.	Alfred F. Webster	Ontario.
Thomas S. Maxwell	Wisconsin.	William H. Woodburn	Scotland.
Charles E. Meerhoff	Indiana.	Walter T. Wright	Michigan.
Richard E. Moll	Michigan.		

BOSTON DENTAL COLLEGE.

The twenty-first annual commencement of the Boston Dental College was held in Parker Memorial Hall, Boston, Mass., on Wednesday evening, June 20, 1888.

The annual address was delivered by Rev. Charles A. Dickinson, and the valedictory by Theodore G. Huntington, D.D.S.

The number of matriculates for the session was sixty-eight.

The degree of D.D.S. was conferred on the following graduates by I. J. Wetherbee, D.D.S., president of the college:

NAME.	STATE.	NAME.	STATE OR COUNTRY.
Charles Herbert Allen	Massachusetts.	T. P. Morey	Colombo, Ceylon.
John Stanhope Engs	Rhode Island.	M. J. O'Connor	Massachusetts.
Alfred Armand Frost	Massachusetts.	John William Patch	Massachusetts.
F. M. Hemenway	Massachusetts.	Fred Prosper Piper	Massachusetts.
E. C. Hinckley	Massachusetts.	L. O. Pollard	New Hampshire.
C. E. H. Higgins	Massachusetts.	William Rice	Massachusetts.
T. G. Huntington	Massachusetts.	A. E. Snow	Massachusetts.
F. A. Knowlton	Maine.	B. B. Stoddard	Massachusetts.
E. H. Lincoln	Massachusetts.	H. H. Warren	Massachusetts.
F. DeS. Magee	Massachusetts.		

EDITORIAL.

THE JOINT MEETING.

A CAREFULLY-PREPARED programme of the joint meeting of the American and Southern Dental Associations, to be held at Louisville, Ky., commencing August 28, has been received. It contains a list of the officers and committees of both associations, with the

order of business, officers of sections, etc. The indications are that the meeting will be one of unusual interest. For information as to railroad fares, hotel rates, etc., see notice under the regular department heading of society proceedings.

NEW YORK'S AMENDED DENTAL LAW.

We print herewith the amended dental law of the State of New York, which bears the following title: "Chapter 280: An act to amend chapter five hundred and forty of the laws of eighteen hundred and seventy-nine, entitled 'An act to regulate the practice of dentistry in the State of New York.'" Having passed the Legislature, it received the signature of Governor Hill, May 10, 1888. It reads as follows:

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. Section one of chapter five hundred and forty of the laws of eighteen hundred and seventy-nine, entitled "An act to regulate the practice of dentistry in the State of New York," is hereby amended so as to read as follows:

Sec. 1. It shall be unlawful for any person to practice dentistry in the State of New York for fee or reward or to assist in the practice of dentistry as either agent or employe, unless he shall have received a proper diploma or certificate of qualification from the State Dental Society or from the faculty of a reputable dental or medical college, recognized as such by said society, and shall be duly registered and shall have received a certificate thereof, as provided in section three of this act; provided, that persons who were engaged in the practice of dentistry in the State of New York on the twentieth day of June, eighteen hundred and seventy-nine, who shall comply with the requirements of section three of this act, shall be otherwise exempt from the provisions of this section, and provided further that nothing contained in this section shall prevent a student who is pursuing a regular course of instruction, from assisting a person in the practice of dentistry qualified as hereinbefore provided.

Any person who shall practice dentistry for fee or reward in this State, without having complied with the regulations of this act, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not less than fifty, nor more than two hundred dollars for each offence. All such fines shall be paid into the treasury of the county where such conviction shall have taken place, for the benefit of the common schools of the county.

Sec. 2. Section three of said act is hereby amended so as to read as follows:

Sec. 3. Every person practicing dentistry within this State shall register in the office of the clerk of the county where his place of business is located, and in the office of the clerk of any county into which he shall remove his place of business, in a book to be prepared and kept by the clerk for that purpose, giving his name, office, and post-office address and the date of such registration, and shall, on presenting to the county clerk a certificate from the member of the State Board of Censors appointed by the State Dental Society for the judicial district in which such county is situated that he has received a proper diploma or certificate of qualification as provided in section one of this act, be entitled to register

and to receive a certificate of such registration upon the payment to the county clerk of a fee of fifty cents.

SEC. 4. All acts or parts of acts inconsistent, or in anywise conflicting with the provisions of this act are hereby repealed.

SEC. 5. This act shall take effect immediately.

Further information in reference to the law may be obtained by addressing Dr. William Carr, chairman of the State Committee on Dental Law, No. 35 West Forty-sixth street, New York City.

BIBLIOGRAPHICAL.

THE STUDENT'S MANUAL AND HAND-BOOK FOR THE DENTAL LABORATORY. By L. P. HASKELL, of the Dental Department of the Northwestern University. 12mo, cloth, 79 pp. Philadelphia: Welch Dental Co., 1887.

This little volume, embodying, as the author claims, the result of forty years' experience in the dental laboratory and of exclusive attention to prosthetic dentistry, is devoted to principles and precepts immediately related to the construction of dental substitutes. Such a condensation cannot but prove of value to every dental student, and as well to every practitioner engaged in that class of work. Fourteen pages serve to set forth Dr. E. H. Angle's methods of correcting dental irregularities. The book will certainly prove convenient and useful as a laboratory hand-book, and as such we cordially commend it.

ANESTHETICS: Their Uses and Administration. By DUDLEY WILMOT BUXTON, M.D., B.S., member of the Royal College of Physicians, etc. Illustrated; 160 pp. and index. Philadelphia: P. Blakiston, Son & Co., 1888. Price, cloth, $1.25.

We have in this volume of 164 pages a carefully-prepared treatise on anesthetics. Its object and, we think, its value are so well indicated in the preface that we cannot do our readers a better service than to quote from it:

"It is surprising that surgeons, who have witnessed the attempts of novices to give anesthetics, should hold any view save that no one is capable of safely giving any anesthetic unless he has been carefully taught and has obtained considerable experience. Personally, I do not believe that the perusal of any book will enable a medical man to do more than learn the rudiments of anesthetizing; but a book may be of undoubted service to the thoughtful student or practitioner, in enabling him to appreciate the dangers incident

to, the caution necessary in anesthetizing, and to grasp the rationale of the various methods of procedure. Unfortunately, the subject of anesthetics has for some years escaped the notice of the scientific side of the profession, and as a natural result has been relegated to the domain of routine. In this book, which has been written purely from the stand-point of every-day practice, I have attempted to indicate that the matter dealt with has a scientific as well as a work-a-day aspect, and that he who desires to be more than a mechanical (and hence dangerous) administrator of anesthetics, must be scientifically as well as practically educated in his art."

Whatever other work on anesthetics the administrator of them may possess, he will do well to add Dr. Buxton's excellent treatise thereto.

Pamphlets Received.

Transactions of the Dental Society of the State of New York, at its eleventh, twelfth, and thirteenth annual meetings, held at Albany, N. Y., in 1879, 1880, and 1881. Rochester, N. Y.: Post-Express Printing Co., 1888.

Internationale Zeitschrift für Allgemeine Sprachwissenschaft. Begründet und Herausgegeben von F. Techmer. III Band, 2 Hälfte, mit 39 figuren. Leipzig, 1887, Johann Ambrosius Barth.

OBITUARY.

DR. EMIL B. GARDETTE.

Died, in Philadelphia, Pa., June 17, 1888, Dr. Emil B. Gardette, in the eighty-fifth year of his age.

Dr. Gardette was born in Philadelphia, August 12, 1803. He was a son of James Gardette, a native of France, who was a surgeon in the French fleet under Rochambeau. He came to this country in January, 1778, and in a short time began the practice of dentistry at Newport, where he remained until 1784, when he came to this city. In 1829 he returned to France, and died in 1831. His son, Emil, received instruction in medicine and dentistry from his father. In the spring of 1822 he was deemed competent to begin practice, and was sent to Reading. Returning, he was graduated from Jefferson College in 1838, and for many years was celebrated as a surgeon-dentist. His first wife was Elizabeth Ann, daughter of Mr. Samuel Badger. Two children were born to them, but both died. In 1851 he married his second wife, who was Catherine Thompson, daughter of the late George Pepper. In 1856 he was made a trustee of Jefferson College, and was elected president of the board in March, 1876, holding that position up to the day of his death. He was also closely identified with the general conduct of the Jefferson College

Hospital. He was chosen a fellow of the College of Physicians in July, 1870, and was a member of the Academy of Natural Sciences, the Historical Society of Pennsylvania, and the Société Bienfaisance Française.

J. E. SLEGEL, D.D.S.

Died, in Reading, Pa., June 30, 1888, of pulmonary phthisis, Joel E. Slegel, D.D.S., in the fifty-sixth year of his age.

Dr. Slegel was born at Fleetwood, Pa., April 14, 1833. His boyhood was spent on a farm, of which, however, he early tired, and, after a few years of roving in the far West, returned to his native county to become associated with his brother in the then, hereabouts, crude profession of dentistry. He moved to the city of Reading some thirty years ago, and might therefore be regarded as one of its pioneer dentists. He graduated in the Philadelphia Dental College in 1868. He was an active and valued member of the Lebanon Valley Dental Association, and a member of both the Pennsylvania State Dental Society and the American Dental Association.

For many years Dr. Slegel enjoyed a large and lucrative practice, close attention to which, together with a hereditary taint, brought on the disease to which he finally succumbed.

In the death of Dr. Slegel a wife and three children lose a devoted and beloved husband and father, the profession a zealous votary, and society a respected and valued citizen. C. V. K.

HINTS AND QUERIES.

To the Editor of the Dental Cosmos:

Dear Sir: Is it true, as claimed by some of the leading dentists of Boston, that any tooth with pulp exposed, either by disease or in excavating, will certainly cause trouble within three or four years if the pulp is capped and the tooth filled? They teach that such pulp must be devitalized and removed in *every* instance. If this be so, the country dentist will be obliged to extract all such teeth or spend half his time in work for which his patients are both unable and unwilling to pay. What is the testimony on this point?—H. F. G.

Fifth-Nerve Reflexes.—So many cases have been reported of eye and ear troubles dependent upon irritated lesions of the dental branches of the fifth nerve, that a reversal of the usual order is of special interest. Dr. A. D. Williams reports in the *St. Louis Medical and Surgical Journal* a case of a young man suffering from toothache in the upper jaw. The patient was referred to him by a dentist who failed to find any explanation of the disturbance in the teeth. On examination he found a well-marked abscess in the right drum. A puncture permitted the escape of pus, with instant relief of the "toothache."—E. H. L.

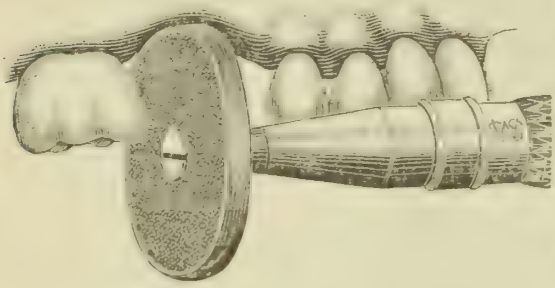
To the Editor of the Dental Cosmos:

Sir: I beg leave to say that I have tried the "Pulverized Pumice and Glycerin," mixed and kneaded into a stiff dough, for making dies, and in my hands, following the directions as closely as the short paragraph of Dr. H. P. Osborn,

South Orange, N. J., indicated, report it an utter failure. The zinc spluttered and bubbled worse than if poured on sand that was too wet, and left the die, as a matter of course, with great holes in it. Besides this, it filled the laboratory with a dense white smoke that was difficult to exclude without opening every door and window.

Not wishing to give it up without a fair trial, I mixed more, making it no damper than I would molding-sand or marble-dust. Although in this condition there was no bubbling, the smoke was present, but not so thick or persistent. The die made was no better than could have been made either with marble dust and water, molding-sand and water, or plain Spanish whiting,—with the disadvantage of the smoke, and the still greater disadvantage of expense, viz.: one pound powdered pumice, 15 cents; one-half pint glycerin, 25 cents; 40 cents.—THEODORE F. CHUPEIN.

SAFE-EDGE STUMP CORUNDUM WHEEL.—In the process of grinding the sides of teeth which are to be capped for bridge piers, the gum is liable to be wounded by the edge of the corundum wheel, but if this is covered with a smooth tire or band of metal, as shown in the illustration, the wheel will cut only upon its sides, and leave the gum unharmed.



A similar safe edge may quickly be given to any grinding wheel by simply melting a little shellac with a hot iron on the wheel edge while it is being rapidly rotated. As the wheel becomes worn upon its sides, the metal or shellac band may be turned off with a sharp or a hot tool, to give the wheel sides a grinding contact with the tooth sides, and yet preserve the gum or tooth neck from injury.—THOMAS A. LONG, Philadelphia, Pa.

NOTCHING OF THE UPPER INCISORS.—My attention has recently been called to some remarks by Jonathan Hutchinson with regard to a notched condition of the upper central incisors, which is sometimes erroneously accepted as the notching produced by syphilis. It was my pleasure recently to correct an error of this kind into which a medical friend had fallen. The condition alluded to is one which at times is not to be explained by a history of convulsions in infancy, by the administration of mercurials, or by one or other of the eruptive fevers. Mr. Hutchinson affirms, and the instance to which I have referred confirms his conclusion, that we must admit inheritance as an occasional explanation of such peculiarity. The chief point of difference between the syphilitic tooth and that referred to is that the cutting-edge in the latter case retains its full width, while the syphilitic tooth is narrowed at its extremity. There are cogent reasons for the avoidance of an erroneous diagnosis in this class of cases.—J. H. T.

STOMATITIS.—Allow me to call the attention of the profession to the following formula for a mouth-wash and gargle, which I extract from the *American Journal of the Medical Sciences*:

℞	Acid. tannic	ʒ ii;
	Tinct. iodinii	℈ iv;
	Potassii iodidi	gr. xx;
	Tinct. myrrhæ	℈ iv;
	Aqua rosæ	f℥ viii.

Use of this a dessertspoonful in a small glassful of water.—W. R. P.

THE

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ORIGINAL COMMUNICATIONS.

A STUDY OF THE PRACTICE OF FILING AND OF EXTRACTING TEETH, FOR REAL OR ALLEGED BENEFITS.*

BY J. MORGAN HOWE, M.D.S., M.D., NEW YORK, N. Y.

(Read before the New York Odontological Society, June 12, 1888.)

In calling attention to this subject, I am impressed with the diversity of views that are held, and also with the fact that it is quite generally regarded as being of less importance than some other subjects that appear more scientific to the superficial observer. Our literature contains many references to it, but they are mostly theoretical and fragmentary. Assertions abound and arguments are sufficiently numerous, but until the appearance of the paper presented before this society by Dr. I. B. Davenport, the subject, so far as I know, never has received scientific treatment. No matter claiming our attention is more deserving of careful observation and study, for none is of more direct influence on practice, and none is more capable of being reduced to a scientific basis of ascertained facts. In the presentation of facts as a basis from which to draw conclusions, Dr. Davenport's essay is particularly worthy of commendation and emulation, and it can hardly have failed to so impress every one interested in the matter, for even those who disagree with him must, I think, admit that all future progress must be made upon the line of work that he has adopted.

Facts must be presented as the basis of argument. We need facts in great number, and when these are well understood and correctly interpreted we shall have reached the level of scientific practice; recognizing both the assured and the problematical in the results of our procedures.

* This paper is partly a review of a paper by Dr. I. B. Davenport, of Paris, France, published in the Dental Cosmos for July, 1887.

I desire as deliberately and positively as possible to indorse what Dr. Davenport has said in opposition to the practice of cutting or filing the teeth for separations. Some years ago, for a short time after the publication of Dr. Arthur's book, I indulged in that practice, but the ultimate results were very unsatisfactory. I say *indulged*, because at the time I found it a great convenience in operating; it made the work easier, and it was only abandoned later from the positive conviction of its pernicious effects. Subsequent decay was not prevented, mastication was meantime hampered, temporary separations were followed by worse contact, and all later operations for approximal decay were rendered more difficult, unless cutting or filing was again resorted to.

I have since repeatedly examined the mouths of persons whose teeth have been cut or filed apart by some of the best exponents of that practice, desiring to revise my judgment on the subject, but the conviction which caused me to desist has always and constantly been confirmed by the appearance of the same evils, with no compensating advantages.

Keeping before my mind the "preservation of the teeth in the greatest efficiency and for the longest time," I have never seen anything in the way of cutting or filing separations that I could regard as successful, and the discomfort of such operations was made painfully apparent to me personally some years ago. I might show models to prove the bad results of this practice, but they would only repeat what Dr. Davenport has shown with sufficient clearness to support the charge. It devolves now upon the advocates of this practice to prove that these are not fair samples of their work. They practically affirm that they can cut and file with beneficial results; the onus is placed upon them to establish their claim by the model and record. At present the reasons set forth for preserving the normal shapes of teeth seem to be sufficiently convincing to satisfy all who are open to conviction. There must, therefore, be very few instances in which any other method of filling approximal cavities than making full contour fillings can reasonably be regarded as the best; and with present facilities for doing such work successfully there remains no good reason for objection to it.

In regard to the propriety of extracting teeth to effect a more favorable arrangement of those that remain, I will submit some cases—by casts and illustrations—and call your attention to facts in connection therewith, which lead me to a different conclusion than that which has been so ably presented by Dr. Davenport. I have studied his paper with the care that it deserves, and have only commendation to offer for his admirable showing of the facts which he presents, but question whether the bearing of these facts upon prac-

tice is in full accord with his deductions. His point of departure, you have observed, is the perfect denture,—perfect in arrangement, —and his opening sentence is to the effect that "nature has furnished man" with such an apparatus.

This statement suggests, I think, the key to the whole variance of Dr. Davenport's view from that which I wish to present. I dispute the statement, and claim that, as a fact, ideal dentures such as Dr. Davenport so admirably describes are seldom seen. They exist in relatively small numbers. His deductions are made from these perfect, ideal arches, while the results of extractions as shown in his illustrations come presumably from irregular dentures; at least we do not know the original condition, nor the purpose in view in removing teeth from them. I think we are safe in assuming that none of them were originally ideal dentures. Some of them show that they were not, and it is misleading to hold up the ideal as the type by which to judge results, when the originals were irregular or distorted, and incapable of being brought to perfection. The experience of practice is, that all sorts and conditions of variation from the ideal are constantly presented; and intelligent judgment must be used to choose between evils. Argument from the standpoint of the idealist is alluring, but fallacious. To illustrate, I will refer to the fact that a few years ago many of us were impressed with the idea that an effort should be made to save the pulp of every tooth; that every pulp—even part of a pulp—could be saved. The normal tooth has a living pulp, and to have a tooth without a pulp is less than perfection; it is less than we may well wish for. Yet experience has forced the conviction upon most of us that many pulps cannot be saved, and that practically the highest attainable good is better than an ideal unattainable; for efforts after the unattainable entail loss and suffering.

With a full appreciation of the possibilities and limitations inherent in each case, the part of wisdom is to attempt only so much as experience and enlightened judgment lead us to conclude can be effected. I realize that in making this statement I am in danger of being misunderstood, and hasten therefore to say that I would not in the least degree undervalue the nearest approach to perfection that can possibly be attained.

I am not influenced to regard the loss of teeth as of little moment, because of such facts as that related of an old gentleman who was well and happy in the possession of no teeth but the lower incisors. I have seen a number of cases where the ability to masticate had been lost almost as completely as in this one, in which no admission could be obtained that they lacked such power. These things only prove our wonderful ability to become adapted to cir-

cumstances. The stomach may do vicarious duty, and the health continue good, but the loss of masticating power is a *fact*, and an important one, even if it does "take a dentist to discover it," as one gentleman remarked in our last discussion of this subject.

But it does not follow of necessity that an invariable rule of practice should be adopted, condemning the extraction of teeth, if good reason can be shown for such procedure, and some indications for it be determined. The present state of development at which dentistry has arrived is largely due to the need which exists for our ministrations, resulting from the practical fact of to-day, that *nature has not furnished man with an ideal dental apparatus*, neither in arrangement nor structure. Variations from the prototype, in small or great degree, are the rule of daily observation, and perfect dental arrangement and perfect harmony of relation to the face are so much the exception as to be a matter of note. The results of removing teeth from imperfect or distorted arches must for this and other reasons be of much more interest and importance to us, in their relation to practice, than results from similar losses occurring in ideal arches. In imperfect arches we have evils which frequently demand correction or modification; in ideal arches no evils of the same nature exist; in the former a change of condition is desirable, while in the latter no change can occur that will not deteriorate.

In describing the results that he has observed, or has concluded must follow, from the mutilation of perfect dentures by the removal of teeth, Dr. Davenport says, "If any *one* tooth be extracted from the above described ideal dental arches," no important change will occur unless the tooth lost is one of the lower incisors; and then describes very accurately the changes resulting from the latter loss,* and further on says, "Now let us suppose a more common case, viz., that of the extraction of all the first molars from the same ideal mouth," and then describes and illustrates the results that follow.† This is admirable, and should be, I think, a sufficiently well-based argument to prevent any dentist worthy the name from extracting any teeth from perfect arches with a view to improvement. I am sorry to know that first molars are removed from such mouths, and I hope that Dr. Davenport's argument against such practice will prevent all reading dentists from continuing to cherish delusions regarding its results. It seems merely a truism to say that an ideal arrangement of the teeth affords the greatest utility, and the best opportunity for cleanliness,—it is perfection, both in beauty and utility, and no change whatever can be made without proportionate

* Dental Cosmos, July, 1887, pp. 421, 422, 423.

† Ibid., pp. 423, 424.

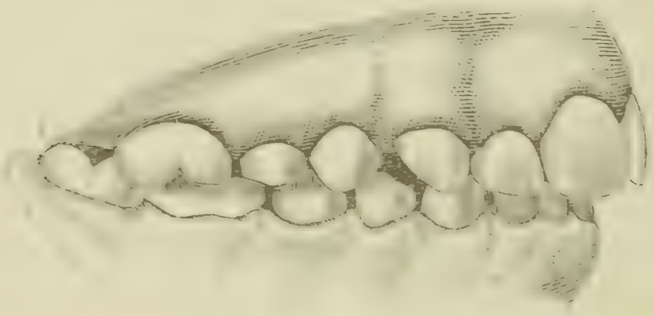
detraction,—and that the most sanguine expectation of preventing decay by the extraction of teeth would not justify the great evil that must be effected in such a mouth by such sacrifice. I hope and believe, however, that the number of those who would do so is very limited. The practice of extracting teeth for the benefit of those that remain has had a reason behind it, when applied to arches that were over-crowded with teeth, and has been resorted to by those of careful judgment as a choice between evils; but the removal of teeth that can be saved, from perfect or approximately perfect arches, or those that can be permanently made so, can very rarely, if ever, be rightly considered the lesser evil. The question that interests us, and on which our differences will mostly turn, is concerning dentures that deviate from perfection, so that teeth are crowded and irregular because they are relatively too large for the arches in which they are placed, and the arches themselves are large enough, or perhaps too large, for harmonious relation with the maxillæ and other facial bones. In connection with these conditions we frequently have such deviation of the relative shape and relation of the upper and lower maxillæ as to produce various aberrations of occlusion.

In order that all the teeth may articulate perfectly, there must be congruity between the superior and inferior maxillæ, and, in calling attention to departure from this condition, I shall not go far astray if, for brevity of description, the variations are attributed entirely to the lower jaw, supposing the upper to remain the same. One deviation from normal adaptation of the lower to the upper jaw may be indicated by a short body and a long rami, including between the former and the latter a small angle, thus tending to a depression of the molars and bicuspids, and elevation of the lower incisors and cuspids, so that the point of contact, if it exists, of the latter with the superior teeth is nearer the gum than normal; and the points of the inferior incisors may in some such cases quite touch the gum behind the superior teeth, accompanied perhaps by protrusion of the anterior upper teeth. The other direction of variation may be presented by a long body and short rami, with a large angle included between them, tending, in proportion to the pronounced character of these peculiarities, to elevate the lower molars and bicuspids and depress, as well as project forward, the inferior incisors, so that the latter may articulate nearly or quite on the edge of the corresponding superior teeth, or may close over and outside of the latter, as in familiar cases of protrusion; or the points of upper and lower incisors may be separated by a wide space, when the posterior teeth are closed. In all these departures from perfection we recognize want of adaptation of teeth to jaws, or jaws to each other, or both. Arguments based upon the assumption that perfection is the order

of nature clearly do not apply to these irregularities, and yet variation from the ideal is more frequently seen than perfection.

I present two models to illustrate these conditions,—Fig. 1, in which the bite is too short,—the lower incisors almost striking the gum,—answering more or less accurately to the first-described condition of maxillæ; and Fig. 2, where the bite is too long, answering to the latter description. These are purposely chosen as not showing extraordinary conditions, but suggesting many varieties of maladaptation of the two jaws.

Fig. 1.



Then there are the great number of incongruities so familiar to us, in the relation of the teeth to the arches in which they develop. I recall the inspection of mouths in which the maxillary arches were so broad and full, with the teeth relatively so small, that there was contact between very few in the same jaw, and between some there were wide spaces.

Fig. 3, from the cast of an arch of this kind, serves to illustrate such a deviation from the normal ideal type.

Fig. 2.

I have never seen such an arch as this that was too large for harmony with the face, although such conditions may exist; the lack of fitness seems to be referable entirely to deficiency in the size of the teeth. The loss of a tooth in such a mouth would evidently be disastrous, and I devoted much time and effort toward the preservation of the broken-down molar shown in this figure, whereas the difficulty and uncertainty of its permanent salvation

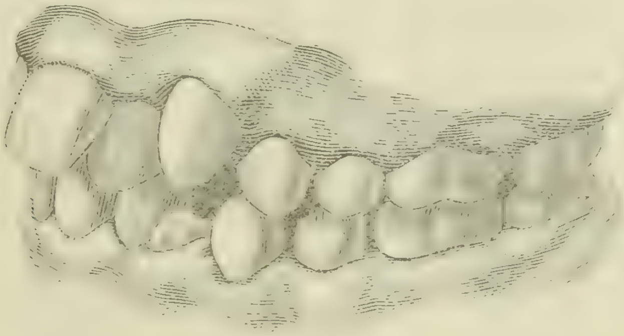
might well have had serious weight in considering what might be best for its owner if it had presented in a mouth overcrowded with teeth.

Fig. 4 represents, on the other hand, the teeth of a boy thirteen years old, showing a somewhat crowded condition of the anterior teeth. The arches are of good size, but not quite large enough for

FIG. 3.

a regular arrangement of the teeth, and the irregularity that exists is evidently an inheritance from his mother, whose teeth present a very similar crowded appearance. Enlargement of these arches and a regular arrangement of the teeth could undoubtedly be effected, but my opinion was that this would result in an undue fullness of the mouth and prominence of the teeth, and that, moreover, the inherited tendency to irregularity in the anterior teeth would contin-

FIG. 4.



ually tend to re-assert itself, and would probably prove eventually the conquering, because most persistent, force, unless the conditions were more positively changed than they could be with all the teeth in situ. My observations indicate that inherited tendencies of this character re-assert themselves even after retaining fixtures have been worn a long time, and that in all cases *crowded teeth*, although made

regular, are finally made irregular again; whereas, if the changes made are sufficiently radical, they may be expected to be permanent. For these reasons, in this case (although it is not an extreme one) I advised the extraction of the four second bicuspids. I have the more pleasure in showing this case because it illustrates certain differences of opinion. My friend Dr. Bogue informs me that he was consulted in the same case, and, without knowing at the time that I had seen it, advised against extraction of any teeth. I shall be much interested, if I am permitted, to see the results of regulating in this case without extraction after ten years or so have elapsed.

But it is especially desired to direct attention to actual results of the removal of teeth from the arches, not to theoretical propositions about results, nor to individual opinions. The greatest service Dr. Davenport has rendered is in establishing the precedent of presenting facts as a basis from which to form conclusions, and I believe that all progress is only to be maintained on this line. Details must be studied in models, as well as in mouths, in order that causes and conditions may be understood which induce the changes following the loss of teeth. The facts he presented all showed evil results from extractions; but we are not told and need hardly suppose, as before remarked, that the original condition of these cases was that of the ideal; they do not, therefore, quite illustrate that phase of the subject, and can be accepted merely as examples of bad results, and a valid and forcible argument *against indiscriminate extraction*, and *in favor of further study* of the subject.

This lesson cannot be too strongly emphasized, nor the impressive presentation of it too much commended; but in whatever degree it is assumed to be final, and to warrant the enunciation of principles, we must dissent.

One side only has been presented by Dr. Davenport,—all his facts set forth apparently with the purpose of supporting the view he advocates; but there are other facts to be considered and their bearing weighed before we can yield our attention to the summing up. It is to be hoped that much more new evidence will be produced before the verdict shall be rendered.

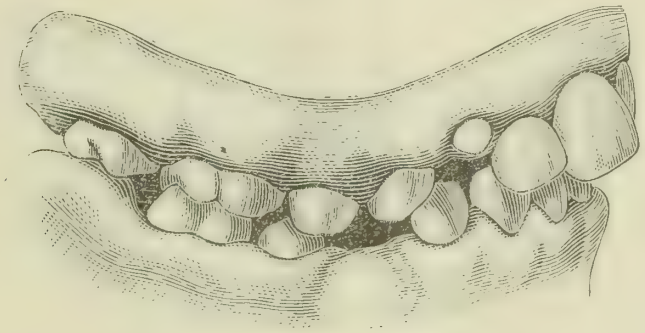
The most notable facts thus far presented opposed to his view of the subject are the two cases given by Dr. Brackett,* in which it is clearly shown that the evils referred to by Dr. Davenport do not always follow the extraction of first molars, but that it may produce the best results. In these two cases the teeth were removed at the ages of eleven and twelve and a half years respectively, and

* Illustrated in the DENTAL COSMOS for September, 1887.

it does not appear that there is either the shortening of the bite or any driving forward of the upper incisors by the lower, which Dr. Davenport anticipates from the study of the perfect denture; nor do the internal rows of cusps of the upper and lower arches show separation. Dr. Brackett states that in one case the incisors were irregular, and I infer that it was so in the other also, for he says, "No appliances were needed to correct the irregularities." This condition of irregularity or prominence of the anterior teeth is that which in my own experience has been attended with the most favorable results when I have resorted to extractions. It will also be remembered that the molars removed by Dr. Brackett were all "extensively" or "largely" decayed; an additional weighty reason for the operation, which has been shown in these cases to have been so wisely performed.

The question that interests us here is, *why* were these extractions followed by such good results? and *how* shall such mistakes and mutilations as Dr. Davenport has shown be avoided? It does not

FIG. 5, A.



seem to me reasonable to conclude because injury has been and is being inflicted by extractions, that the rule *never extract* must be adopted; for, in order to arrive at such a conclusion, we must refuse to recognize the fact that nature has failed to provide man with a perfect denture, and also the other fact that imperfect and distorted dentures have been improved by extraction.

Shall we not then begin to set in order what knowledge we have and can obtain of all the conditions which have preceded both favorable and unfortunate results from extractions, in order to a better understanding of the causes of success and failure? With this desire I present a few cases which seem to throw some additional light upon the subject.

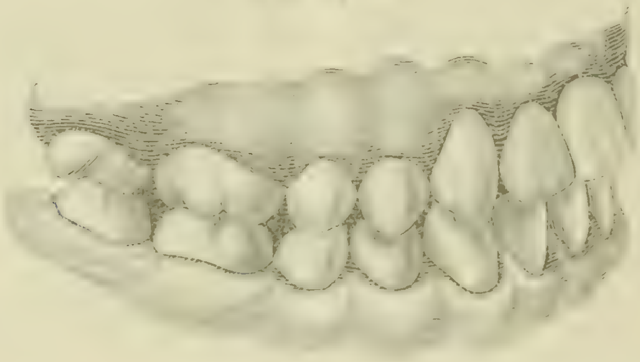
Fig. 5, A, represents the teeth of a boy in his thirteenth year. The left superior first molar had been lost before I saw him; both of the inferior first molars were very poor in structure and largely filled; the pulp of one was dead. The superior cuspids, which were just erupting, had very little room for regular alignment, and there was

some crowding of the superior incisors. On account of these conditions, and the hopeless condition of the first molars for permanent preservation, I had the latter removed in June, 1874, before the eruption of the right inferior second molar or of either of the inferior first bicuspids. The case received no other treatment except the filling of cavities in the teeth.

Fig. 5, B, represents the same case at the present time. The same irregularity of the incisors is apparent; it is, in fact, rather increased than diminished; but this is not in any way due to shortening of the bite, for the length of the bite is *increased;* the second molars have moved forward to the second bicuspids with very little rotation on their axes, and no perceptible tipping. The third molars are in place fully developed, and the articulation, both from an outside and an inside view, leaves very little to be desired.

A careful examination of the two models makes it evident that the forces of dental development must have been superior to those

Fig. 5, B.



of the muscles which close the jaw, for the length of the bite, instead of being reduced, is increased.*

The partially developed second bicuspids have fully developed, and the first bicuspids—which had not appeared when the molars were extracted—have developed to their normal length; all the molars and bicuspids appear longer than in the earlier model, and as the lower incisors do not shut so far up, behind the points of the upper incisors, there seems to be no doubt that the bite is actually lengthened. I call attention to this fact, which I have not seen before recorded, because there have been other cases which have seemed to me to present similar changes; a physiological elongation of the bite, even after the thirteenth year.

After the loss of the molars the bicuspids evidently moved back, so allowing the superior cuspids to develop in good position; but the development of the third molars occurred before the upper in-

*Dental Cosmos, July, 1887, p. 424. Dr. Davenport says that the bite will be shortened "if the first molars are lost before the eruption of the bicuspids."

cisors were permitted to move back, the second molars having been crowded forward, and all spaces anterior to it closed, by the force exerted through the third molar. The same force has been sufficient to crowd the superior incisors further forward than they were, for on the right side they are further in advance of the lower incisors than they were originally, when the teeth are closed.

The third molar will be referred to later, as a factor, and an element of uncertainty, in the results following extractions.

FIG. 6, A.

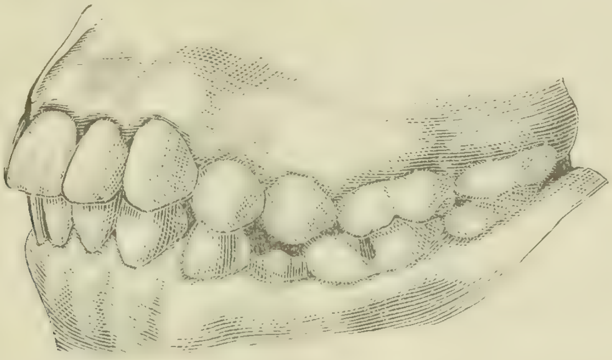
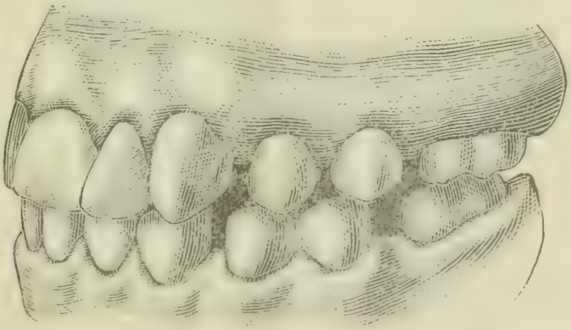


Fig. 6, A, represents the mouth of a young lady sixteen years of age, as it was when she came to me in April, 1877. A fine set of teeth—as may be seen by the first molars set in the plaster—somewhat crowded; the anterior teeth inclining forward, and slightly irregular, the lower incisors striking the lingual surface of the upper incisors midway between point and neck; the four second molars fully developed, and the left inferior second bicuspid retarded in development by the crowding forward of the crown of the first molar. It was decided to remove the first molars in this case, because the

FIG. 6, B.



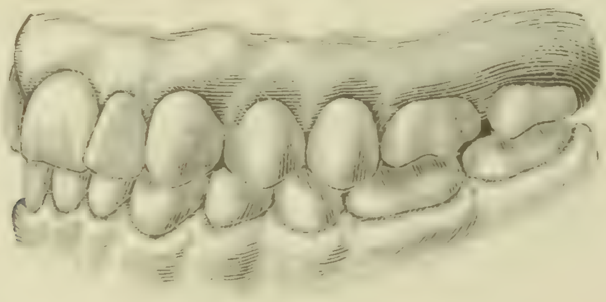
arches were already rather too large for harmony with an otherwise handsome face. There was no reason—excepting consideration of facial expression—why the arches should not have been enlarged,—in fact this procedure had been advised by an eminent dentist; but to my perception there was already an expression of *too much teeth*, and for that reason extraction and contraction were thought advisable rather than expansion.

Fig. 6, B, represents the same case two years later. Impressions

taken in April, 1879. The six anterior teeth of both upper and lower arches have fallen back, so as to appear less prominent. All the teeth posterior to the cuspids are considerably separated from them and from each other, excepting that the first and second lower bicuspids are in contact. The third molars have not yet been erupted, and the case here presents evidence of considerable loss of masticating capability; but an inquiry made at the time in regard to this drew out no admission that the young lady recognized such loss. The patient and family were pleased with the result; appearances had been improved, but the loss of masticating power was obvious although not recognized.

Fig. 6, C, represents the same side of the same mouth at the present time, eleven years after the extractions. The third molars are fully developed, and all the spaces anterior to it—which were so evident in the former condition, Fig. 6, B—are obliterated. The case now presents a nearly perfect articulation, both from the external and internal aspect. The only blemish discoverable is on the

Fig. 6, C.



lingual view of the right side, where the very slight tipping of both the upper and lower second molars causes the anterior cusps to be separated a little; and this is practically of no consequence. It will be evident, I think, that the favorable results here shown, when compared with the condition in Fig. 6, B, were dependent on the development of the third molars. There has been sufficient force exerted by them to move the second molars, the second bicuspids, and even slightly the first bicuspids, so as to effect the closing of all the spaces between these teeth and produce a practically perfect result, upon the posterior as well as the incisor and cuspid teeth. These results in this case show that Dr. Davenport's generalization,* "never after the eruption of the second molars can extraction of first molars be considered other than a misfortune," needs qualification. The second molars were here fully erupted, and in perfect occlusion with their antagonists, before extraction of the first molars, and it will be remembered that this is the condition claimed by Dr. J. T. Codman, in the discussion of this subject, to be most

* Dental Cosmos, July, 1887, p. 429.

favorable to prevent tipping of the second molars. I am not prepared to advocate any rule on this point, however; the results are merely presented, and your attention is called to the fact that the bite in this case, as well as in the one previously shown, has not been perceptibly shortened, and that a "forward projection of the arches, and the production of a deformity worse than the one sought to be corrected," has not resulted, but on the contrary the anterior teeth have fallen back as was anticipated.

Dr. Davenport calls attention almost exclusively to mechanical or muscular force, and its effects on the teeth that remain after extractions; but physiological forces ought not to be overlooked.

Of the latter, the most important is that exerted in the development of the "wisdom-teeth." In the case illustrated in Fig. 5, A B, the slight increase of forward projection of the upper incisors is not caused by shortening of the bite,—there was no shortening,—but by the force of the third molar driving all the teeth in front of it further forward, so that at present the lower incisors do not touch the upper teeth. The same agency is perhaps more clearly and certainly discerned in Fig. 6, B and C, in the forward movement of all the teeth posterior to the cuspids, so as to close up all spaces, as has been shown. I am confident, also, it must have been a matter of common observation that, when wisdom-teeth develop behind full arches, the anterior force exerted in their development will frequently—almost certainly—cause an increase of any irregularity that may exist among the anterior teeth, and sometimes cause some irregularity when none existed previously.

This same influence is shown in one of Dr. Davenport's illustrations.* See Fig. 13, J, M, and N, the left side of a mouth from which the first molars had been removed at nine years of age. Here the development of the lower third molar was one reason—if not the only one—why the front teeth are crowded "just the same as they were before extraction." The result can hardly have been due to shortening of the bite, for no teeth had been removed from the right side of the mouth. Other instances might be exhibited, but the point is sufficiently clear, I think, that the third molar is one of the most important factors in determining the ultimate results of extractions; and yet it is true—as Dr. Underwood of London has said—that "no other tooth is so unreliable and uncertain." If the size and period of this tooth could be depended upon, it would have much to do with determining the question of the proper time to extract teeth when such operations are considered desirable, but the fact of its uncertainty makes all the results of extractions—espe-

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* DENTAL COSMOS, July, 1887, pp. 425–426.

cially of first molars—uncertain also. After the extraction of these latter teeth, the bicuspids and the six anterior teeth tend backward, and the second molars have a like tendency to move forward to occupy the vacant space. This notable tendency I believe to be due in a great degree to another physiological influence, namely, the contraction of cicatricial tissue. If now the third molars are developed so soon after the extraction of either bicuspids or molars—to correct irregularity or undue prominence of anterior teeth—that the teeth posterior to the space are carried forward by the force of the developing teeth, and the space is thus occupied entirely from behind, all the anticipated good effect on the anterior teeth may be frustrated; while, on the other hand, if just sufficient time has elapsed after extractions to permit the anterior teeth to move, so as to assume less prominence, or occupy enough of the space for regularity of arrangement, wisdom teeth of normal size may carry forward the second molars, and close all spaces posterior to the cuspids, and thus conduce to the best attainable results. Or if again the wisdom-teeth are delayed in development or are merely rudimentary in size, disfiguring spaces may be effected between the incisors; or, that drooping position of the superior cuspid may result which more than anything else produces that unfortunate expression of mouth and teeth which has been referred to in the former discussion of this subject. In my experience the second molar will be most apt to tip badly, for lack of the assisting force of the third molar behind it, to move it bodily forward at the right time, till contact with the second bicuspid has been attained.

It is obvious then that a very large element of uncertainty must be taken into the account in anticipating the results of any given case of extraction,—especially of first molars,—unless mechanical means are used to produce the movements desired; and that an exact prediction of results of such procedures would be hazardous.*

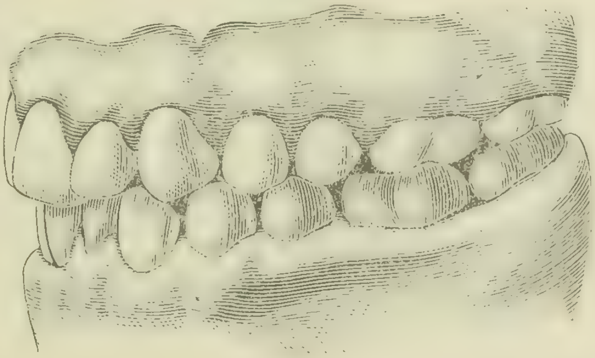
Esthetic effects often constitute a valid reason for considering the propriety of the removal of some teeth; for crowded and irregular conditions are not uncommon, even in arches that are already as large as they should be, and disproportion or mal-adaptation of the maxillary bones to each other causes more or less perversion of occlusion. But the uncertainty attending the results—especially on account of the facts concerning the third molar—seems to present an important ground of objection to the practice of removing good first molars. In the case shown, Figs. 6, A, B, C, although the anticipated results on the anterior teeth were produced and no evil

* Dr. Davenport theoretically concludes that the changes are reduced to "a mathematical certainty," and that we may "safely predict" results. (DENTAL COSMOS, July, 1887, p. 432)

worthy of mention ensued, observation and study of mouths and models, since this subject was last before us, impress upon me the fact of uncertainty and risk attendant upon the removal of the largest and most important grinders in the mouth. With an appreciation of the important influence, and at the same time of the unreliability, of the third molar, if the removal of teeth seems to be required, and the first molars are in good condition, the bicuspids ought to be considered for such sacrifice, because, while they may afford the needed space, their loss is not attended with so much risk of ill effects. Here, again, I am obliged to dissent from Dr. Davenport's conclusion, that we "hardly need to consider the results of extraction of any other than the first molars."

Indications for the removal of teeth do exist, and the application of mechanical force to correct irregularities without extraction is not always a permanent success, when by such sacrifice it might be so. Teeth that are *crowded* in new positions of regularity almost invariably return, after a time, nearly or quite to their old

Fig. 7, A.



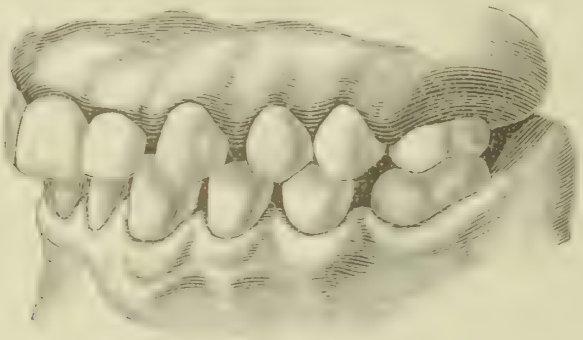
malpositions, and the latter tendency is much increased where the original irregularity has been inherited.

When two or more bicuspids or molars are so wasted by decay as to make their permanent preservation doubtful or impossible, this fact may sometimes well decide a case in favor of extraction, which might better be decided against if these teeth were all in a favorable condition for long usefulness. The structure and probable longevity of teeth should, without doubt, always have weight in deciding the propriety of extractions, but there seems to me as little doubt that the sacrifice of perfect teeth is sometimes justifiable by conditions before suggested.

Such conditions did not exist in the case presented in Fig. 7, A. There was no undue prominence nor irregularity of teeth to justify such a sacrifice. Nevertheless, at the time, I advised the removal of the four first molars, because the teeth were very frail in structure, with many small approximal cavities of decay. I was then infected with the idea that in such cases extraction was justifiable *merely to*

produce spaces. This was in October, 1882. Fig. 7, B, shows that spaces have ensued, but the result, although it has probably prevented decay to some extent, is far from satisfactory; the spaces are not where most needed. The girl was in her thirteenth year when the teeth were removed. The wisdom-teeth are just now making their appearance, too late to prevent or correct disfiguring gaps between the anterior teeth and the dropping downward and backward of the

FIG. 7, B.



cuspids. The latter condition—which I believe generally results from the extraction of first molars, when the cuspids were not originally too prominent—illustrates disfiguring and unfortunate results, that have been alluded to in the discussion of this subject as a reason for never extracting these teeth.

Fig. 8 is from the cast of a lady's mouth who is about thirty-five years old, and shows the results on the incisors of extraction of first molars at about the age of thirteen. The lady informed me that no

FIG. 8.

irregularity existed, and that the teeth were close together, probably in contact. The molars were removed by an eminent dentist of the last generation, only to make spaces. It will be observed that this has also been accomplished where least needed, is most harmful in esthetic effect, and is much regretted by the victim.

While these two last cases show some of the evils of extractions, and illustrate original conditions that imperatively demanded the

preservation of all the teeth (the last case by inference only), they serve to show the tendency, before alluded to, of the six anterior teeth to a retrograde movement, after the extraction of first molars, which may be so much desired when the mouth is disfigured by their irregularity and prominence.

In all these facts and opinions I am well aware there are insufficient data from which to formulate invariable rules, but I believe the facts represent invariable principles; the cases presented were selected for that reason. But I desire to have this contribution regarded as suggestive, and to have the facts here presented become part of the foundation which I hope to see laid for future intelligent practice, whether my interpretation of them is or is not correct.

Opposition to the indiscriminate extraction of first molars or other teeth can be made effective, I think, only by recognizing the facts that seem to bear on both sides of the question. Dr. Davenport has shown what bad results have followed the extraction of first molars in certain cases, and it is well that certain views should sometimes be advocated with all the ability possible. But the defenders of extraction as a practice may offset his argument—as they do—by asserting that he has made up his case from the blunders of incompetents. They can in turn point to facts on their side,—such as Dr. Brackett's cases,—and claim that such results are always to be relied upon in the practice of those who know how and when to do it. And if such extremists get followers—as they will—one class will accomplish much less good than they might do, because they shut their eyes to the legitimate benefits of extraction, and the other class will be perpetuating indefinitely the evils of indiscriminate sacrifice.

This has been the history of practice thus far. Claims made for such good results as overbalance the evils, from indiscriminate extraction of first molars, must of necessity be discredited, both because of the great diversity of antecedent conditions and of the influence of the third molar being always an unknown factor. On the other hand, assertions or arguments to prove universally bad results are refuted by the facts presented.

Heretofore, no data from experience have been offered by which the judgment of the inexperienced might be cultivated or directed. It has often enough been said that *judgment must be exercised*, but no admissions of failures have been recorded by the advocates of extraction. I count it a notable evidence of progress that we are brought to the tribunal of facts, for which our thanks to Dr. Davenport cannot be made too emphatic. Argument in the future must be made from the basis of actual conditions, submitted for various

interpretation. In this connection I would urge the idea—suggested before—that the results of extractions require to be compared, in most cases, with previous conditions of the same case, not with some other case, nor with an ideal arch, in order to arrive at correct conclusions as to benefits or injuries. If all those who take the subject of extraction of teeth into consideration would take impressions and preserve models of cases for future reference, judgment would be cultivated and valuable data rapidly accumulated, as the years go by, for our own and for the general good.

I have a number of cases which show neither such good nor evil results as those I have presented. The loss and injury from the extractions is apparent in the mouth, but the benefits which accrued to some are apparent only on inspection of the old models and a knowledge of the condition of the teeth removed. In some cases I would extract, if I had it to reconsider, and in others I would not; but in all cases I would esteem good first molars of greater value than I did formerly both for their own worth and for the inevitable uncertainty of the results of their removal.

ETIOLOGY OF IRREGULARITIES OF THE JAWS AND TEETH.*

BY EUGENE S. TALBOT, M.D., D.D.S., CHICAGO, ILL.

III.

Arrest of Development and Excessive Growth of the Maxillary Bones.

Excessive growth of bone-tissue is frequently seen in connection with the superior and inferior maxillæ. It may be a natural growth or the result of disease. If the large jaw is naturally so, it will develop gradually, and will not attain its full size before the age of from twenty-six to thirty-six years. The size of the jaw corresponds quite closely to the size of the head, other things being equal, the large head containing the large jaw. We occasionally find, however, a very small jaw in a very large head, and *vice versa*. The upper jaw is more subject to morbid influences than the lower jaw, because of its development in connection with the bones of the head. The lower jaw rarely exceeds the average size. It is possible, however, by constant use, to increase the size of the jaws, as is shown in acrobats and those who use their jaws in performing various feats, like "the man with the iron jaw." The skulls of tobacco-chewers, singers, public speakers, and the early races who lived upon corn, shells, roots, etc., show that the jaws may be increased, or at least

favored in their development, in size, by use. If the bones at the base of the skull are slow in ossifying, as is sometimes the case, the maxillary bone will frequently develop to an unusually large size.

Enlargement of the jaw-bones is an occasional cause of dental irregularities. It may occur in either jaw, but generally in the upper, and is due to hypertrophy on the one hand, or hyperplasia upon the other; also to osteitis, periostitis, continued irritation drawing blood to the part, and, in some cases, to disease of the antrum and nasal fossæ, producing the same effect. Disease of the antrum may cause either periosteal or osteal enlargements. Hereditary syphilis has an especial predilection for the bones, particularly at the junction of epiphysis and diaphysis. The growth of the teeth does not proportionately increase, and the consequent disproportion between the teeth and jaws necessarily produces a deformity. The forms of irregularities of the teeth that co-exist with crowded arches are not seen in enlarged jaws. Rachitis in children, whether due to syphilis or not, causes hypertrophy and hyperplasia of the jaws. The hypertrophy and hyperplasia may be localized in some portion of the jaw, causing it to be unevenly developed.

The last, but not least, of the causes of arrested development of the maxillary bones which I shall mention is that due to constitutional diseases and the eruptive fevers. Debilitating acute diseases (fevers, the exanthemata, etc.) in children are sometimes followed by sudden overgrowth of bone, which is quite noticeable. This process affecting the jaw may account for certain proportions of those cases of measles and pneumonia which are followed by dental irregularities and maxillary deformities. In some cases, however, the process is a low grade of inflammation, which is followed by atrophy of the jaw instead of hypertrophy or hyperplasia. The special predilection of these processes for the superior maxilla is on account of its liberal blood and lymphatic supply, and the contiguity of such cavities as the antrum and nasal fossæ, which, in many cases, contribute their quota of irritation.

The question of diathesis enters largely into the etiology of maxillary and dental deformities. The physical characteristics of strumous children demonstrate this fact quite forcibly. The description of this diathesis given by Fothergill is decidedly apt in this connection: "This diathesis has an imperfectly developed osseous system as one of its characteristics. The bones are small, the shafts slender, the epithesis enlarged; the hands are often unshapely from this osseous defect; the thorax is small; the forehead is high and prominent; the jaw is small, and the teeth crowded and carious." Persons of a nervous diathesis have small jaws, but not in disproportion to the rest of the osseous system. The jaws may be rela-

tively small, however, because the teeth frequently do not partake of the symmetrical smallness of the other bony structures. Constitutional diseases, such as the exanthemata, syphilis, and phthisis, may affect the jaws in common with the other bony structures, and as the teeth do not vary much in size in different subjects, a relatively small jaw results in such cases. Dr. Florence Hunt, of the Cook County Insane Asylum, informs me that the majority of the Swedish and Norwegian patients are affected with scrofula and other constitutional diseases, and that post-mortems reveal soft and undeveloped epiphyses not unlike cartilages.

The first effect of irritation of bone in any situation is a determination of blood-supply with its attendant increase of nutritive material; soon proliferation of young connective tissue begins from the osteophytes and from leucocytes brought by the blood. The young connective tissue soon appropriates the necessary ossific material from the blood, and, after passing through the fixed connective-tissue period of its existence, becomes bone-cells and fibers. In some cases of malnutrition the period of ossification does not supervene, but the soft and spongy bone becomes atrophied, through the contraction and hardening of the connective-tissue stroma formed in the pathological process of perverted bone-building. In some cases there occurs merely thickening of the pre-existing bone-structure, the new connective tissue being absorbed. This constitutes osteoplasia or true hyperplasia of bone.

Where hypertrophy occurs, it may assume one of two forms, viz., an ivory-like hardness, or a spongy condition, indicating the existence of chronic osteitis. When these processes are localized we have one or the other varieties of osteoma or osteoid tumor. These various processes produce a variety of deformities dependent upon their extent and location.

As has been previously stated, the irregularities of the teeth caused from a crowded condition do not exist in enlarged jaws. If the growth of the jaw is uniform throughout, spaces will exist between the teeth as far back as the first permanent molars, differing in width in proportion to the relative positions of the teeth and articulations of the jaws. If the growth of the jaws is not uniform in the natural development, or is the result of disease, the anterior teeth will be influenced in the direction of the growth. In a majority of cases the molars of one jaw will antagonize uniformly with those of the other jaw. The first permanent molars form a fixed point of resistance in the posterior part of the mouth upon which the jaws rest, thus keeping the teeth in a fixed position, the second and third molars coming later and crowding against them. The only exceptions to this rule are cases where the molars have been ex-

tracted too early, and where there are tumors of the jaws. As illustrative of the interesting character of some of these conditions described, I take the liberty to present a few cases which have come under my notice.

Case I. Arrest of development. Girl, age ten. Consumption on father's side; cancer on mother's side. Child scrofulous, with small bones, especially the maxillary bones, which are unusually small. The teeth of both jaws (permanent first molars and incisors, temporary cuspids and molars) are in a very crowded condition. The teeth are normal in size. With such unusually small jaws, and the teeth at this age being very crowded, I shall watch this case with great interest. I shall expect to find marked V- or saddle-shaped arches. I have observed similar results in like cases.

Case II. Arrest of development. Girl, age sixteen. When quite young had a severe attack of scarlet fever, and the arrest of the development of the bony framework resulted. The jaws are unusually small, and the teeth are crowded to such an extent that the cuspids remain outside the arch.

Case III. Enlargement of the superior maxilla. George W., age fourteen. This boy was sent to me for an opinion in regard to his teeth. Upon examination I found the teeth of the normal size. Spaces existed between all the teeth as far back as the first permanent molars. The bicuspids were not fully developed, but were through the gum sufficiently to notice their position in connection with the other teeth. The spaces were not uniform, those between the incisors being the largest. The widest space was between the central incisors; the incisors of the lower jaw coming in contact with the mucous membrane of the mouth posterior to the superior incisors.

Case IV. Hypertrophy of the jaw. J. B., age nineteen. This patient came under my treatment in June, 1887. When fourteen years of age he received a blow upon the side of the jaw. He is of a scrofulous nature. The blow produced a low form of inflammation, and hypertrophy of the bone supervened. The teeth of that side of the jaw were carried laterally, and spaces existed between the bicuspids and molars.

Case V. Antrum disease. Boy, age seven. German descent; born in this country; scrofulous. Quite a deformity was noticed upon the left side of the face, produced by the bulging of the antral wall. Hypertrophy of the alveolar process also existed. The temporary teeth of the left side of the upper jaw extended beyond those of the lower jaw. Upon opening into the antrum a thick, ropy fluid exuded. After three months' treatment no improvement has been noticed.

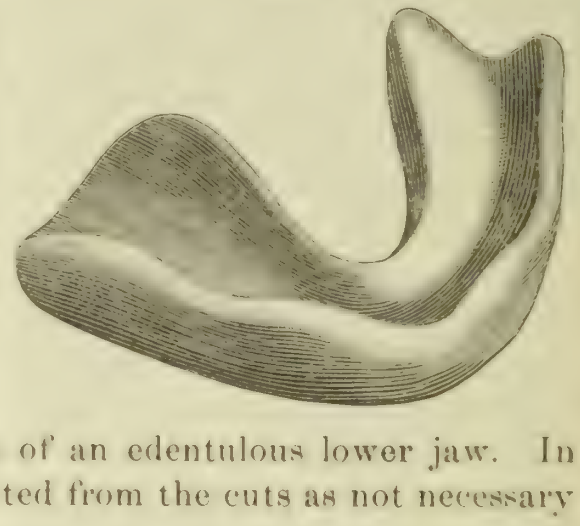
PLASTER PROSTHETIC MODELS.

BY W. STORER HOW, D.D.S., PHILADELPHIA, PA.

In the process of procuring counterparts of the jaws for which dental substitutes are to be constructed, every step should be taken with the greatest degree of exactness attainable, and accurate impressions are therefore essential as matrices in which the working models are to be cast. Impressions of edentulous jaws are commonly taken in mixed plaster, which is held in the bare tray, or in the wax impression previously taken in the tray. An elucidation of this part of the subject is not now entered upon, but it is assumed that in any case, whether the jaw be completely or partially toothless, an impression will be taken in plaster, and that, when practicable, the thinnest part of the body of the impression will be not less than the sixteenth of an inch thick. Fig. 1 exemplifies such an impression of a toothless upper jaw, and Fig. 2 in like manner

FIG. 1.

FIG. 2.



illustrates the plaster impression of an edentulous lower jaw. In both instances the trays are omitted from the cuts as not necessary to be shown.

Plaster impressions are commonly varnished with an alcoholic solution of shellac or sandarac, and then oiled to insure the separation of the casts. The preferable way in most cases is to thoroughly brush the surface with a soft brush and strong soap-suds, and, after an interval of a few minutes to allow for absorption of the water of the suds, to fill the impression with a properly mixed batter of plaster.

Several hours should, preferably, elapse before attempting to separate the cast from the impression, which should be preserved as nearly entire as possible, and when there is not much overhang the separation may be safely effected by progressive smart tappings with a light mallet over the whole surface of the impression. If, however, the labial portions must needs be first cracked off, this may

be done, after cutting a groove in the impression as near along the crestline of the cast as may be guessed, using quick, light mallet-blows to knock off the sections. These are to be carefully kept, and after the separation has been accomplished are to be replaced with the palatal portion on the cast, and, with thin-mixed plaster, built up to the approximate shape of an articulating model. When this has become quite hard it is removed from the cast, which, of course, it perfectly fits. It will also, if as an impression it was correctly taken, perfectly fit the jaw, and may therefore be placed in the mouth and judiciously trimmed until the proper expression has been produced, and the exact dimensions and contour of the desired denture embodied in this plaster articulating model. Such a model is shown in Fig. 3. In like manner one may prepare a similar model of the inferior jaw. Such rigid and exact-fitting models can obviously be replaced, trimmed, and readjusted in the mouth until the best skill of the dentist shall have been expended in obtaining

FIG. 3.

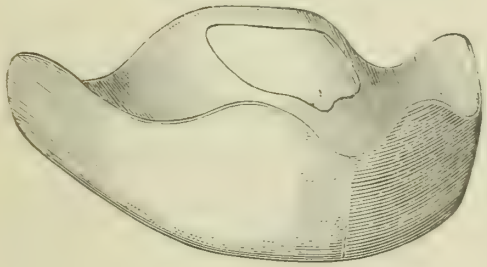
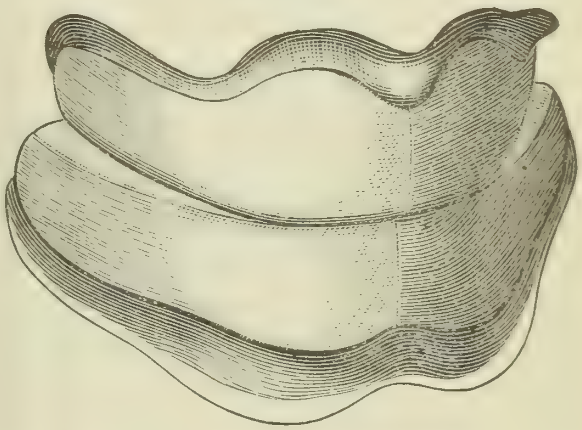


FIG. 4.



models at once artistic and correct. The median-line mark is then made with a pencil or knife, and cross-lines are made on the sides of both models while they are pressed together in the mouth, after many openings and shuttings of the jaws, to be sure that at last the proper relations of the models have been obtained. The occluding surfaces are then dried, warmed, some hot wax is dropped on them, the models are instantly replaced in the mouth, and the side-marks and median-line marks made to exactly coincide, while the models are pressed together by a firm closure of the jaws until the wax has quite stiffened. The joined models can then be taken from the mouth and replaced upon the casts. These are to be fixed with care in a suitable articulator, and the result will be a precise reproduction of the relative positions previously occupied by the models when in place on the natural jaws (see Fig. 4). Attention is here called to the fact that, normally, the horizontal line of occlusion is not straight, but curved so that the superior cuspids are at the bottom of the depression, as illus-

trated in the lines of the models, Fig. 4. In the construction of models for full dentures it is important to maintain this curved line of occlusion, for two reasons. First, the process of mastication is facilitated by the impingement of the lower bicuspids and molars as these are occluded with their downward-graded antagonists by the antero-lateral movements of the lower jaw in the act of grinding the food; second, the facial expression is improved by the rising of the respective planes of occlusion at those points, thus in some degree producing the effect that the limner accomplishes by upwardly-curved lines at the corners of the mouth.

Fig. 4 also shows (though imperfectly) the correctness with which the plaster models may be made to anticipate the outlines of forms which the completed dentures are subsequently to assume in becoming both useful and beautifying works of art. The thin, sharp, inflexible borders of contact with the gum along lines which provide for a firm bearing of the model, and yet permit the free play of all the muscles concerned in acts of mastication and facial expression, are noticeable in Figs. 3 and 4 as being producible in plaster models. It is likewise observable in Fig. 4 that the normal overlap of the upper incisors upon the lower may be reproduced in plaster models, and prove an important factor in sustaining the lips in proper profile relations,—a circumstance too often ignored or overlooked in the preparation of the ordinary wax models. These are in fact commonly so crudely and clumsily formed, and are withal so lacking in resistance to adverse impressions, that not only can no dependence be placed upon them as correct representatives of the relative parts previously studied and produced in the mouth, but from the very fact that wax forms are so easy of displacement and disfigurement, the steps in the process of obtaining such articulating models are hesitatingly and hastily taken, and of course result in faulty dentures, which, more than any other class of dental operations, proclaim the frequent failure of the dentist to so closely imitate nature as to conceal the fact that such an endeavor has been made. The practical permanence of the plaster model obviates all these defects, and, furthermore, admits of such a firm final closure of the jaws that, when at last the corresponding denture is placed in the mouth, both the occlusion and the articulation are found to be correct, as could never be the case after a timid trial closure upon a soft, slippery wax model.

In Fig. 4, as in the succeeding figures, the models and casts are to be viewed as mounted on articulating frames, which do not appear because not necessary for the purpose of illustration.

Upon the removal of the models from the casts, after these have been mounted on the articulator, both representatives of the eden-

tulous jaws will appear as seen in Fig. 5, and in these cases the border outlines of the models are indicated to emphasize the need of making them conform to the muscle insertion lines whenever this is practicable; and that not only because of the increased stability of the dentures when they are free from liability to displacement by the lifting action of muscles improperly so covered, but also because the mobility of the adjacent features and the consequent

Fig. 5.

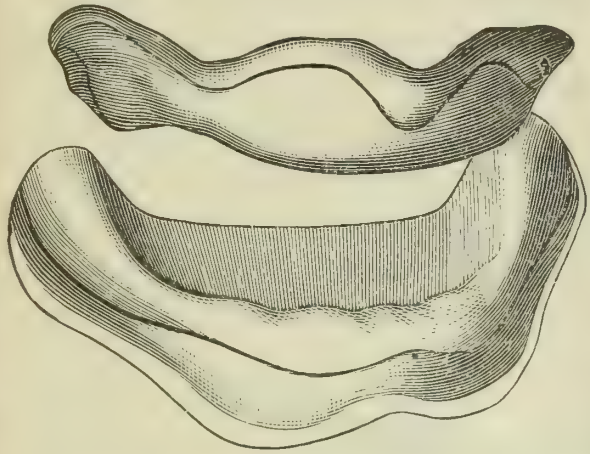
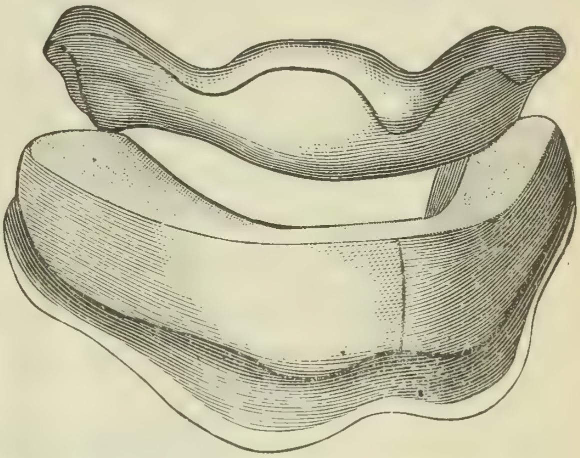


Fig. 6.



naturalness of the facial expression will depend in great degree upon the judicious definition of the boundaries of the dentures.

Fig. 6 shows the cast of the upper jaw in its relations to the articulating model in place on the cast of the lower jaw, and Fig 7 likewise illustrates the cast of the lower jaw as related to the articulating model in position on the cast of the upper jaw.

A close observation and study of these illustrations will make clear

Fig. 7.

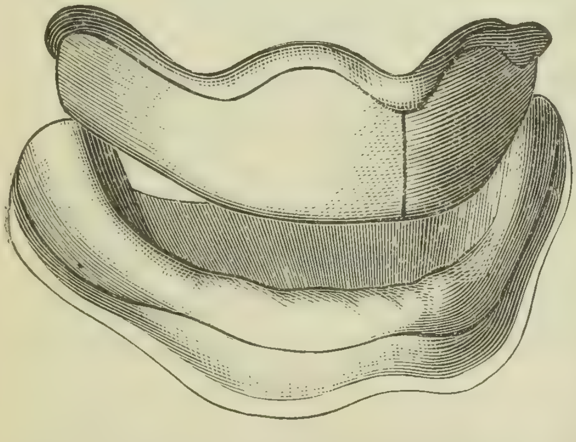
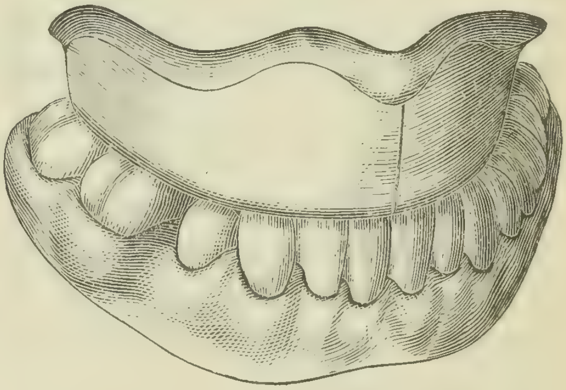


Fig. 8.



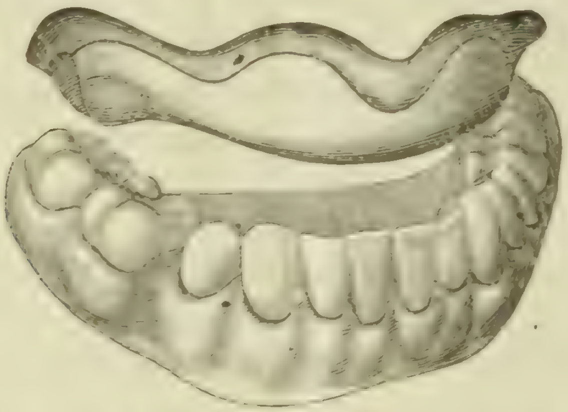
the many points of advantage to be obtained by the employment of plaster in the construction, fashioning, and adjustment of prosthetic models for full dentures.

Complete upper artificial dentures for use with more or less complete lower natural dentures constitute a large class of the cases coming within the province of the dentist, and for these the plaster articulating models are especially adapted.

Such a model as that shown in Fig. 3 may be suitably shaped to articulate with the natural teeth of a lower jaw, as illustrated in Fig. 8, and in the process of shaping the plaster model great satisfaction will be derived from the security of the model's retention in the mouth, the firmness with which the lower teeth may be closed upon it, and the certainty with which, by frequent repetitions, a natural occlusion may be obtained. When this has been done, and all the artistic conditions are complied with in perfecting the shape of the model, it is to be removed, warmed, and thus dried on its occluding surface, so that a roll of very soft impression-wax may be placed upon it, and all be quickly replaced in the mouth.

Repeated normal closures of the jaws are to be made, and the jaws then held tightly closed while the fingers of the operator are rapidly pressed upon the wax which covers the faces of the teeth, so that on opening the jaws and carefully removing the model and wax there will be found an accurate impression of the teeth, which

FIG. 9.



will have passed through the wax to the model, pressing it firmly into its seat. The result is shown in the articulated model and cast. Fig. 9 shows the articulated casts when the model has been removed.

If proper care has been taken in pursuing this process up to this point, the succeeding steps in the construction of a continuous gum, gold, celluloid, or vulcanite denture may be taken with complete confidence that the substitute, if made in strict conformity to the models, will exactly fit the maxilla, articulate with the natural teeth, and impart an appropriate expression to the related features of the patient.

The foregoing method may in some cases be practiced when modeling composition has been used in taking the impression; or the composition may be employed in building the model upon the cast which has been made from a plaster impression. But for general use—and all the more so as the practice shall become familiar—plaster will be found most reliable and satisfactory as a material for both the impressions and the models.

THE TREATMENT OF ACUTE PULPITIS.

BY EDWARD C. KIRK, D.D.S., PHILADELPHIA, PA.

The treatment of acute local inflammatory conditions by the application of sedative remedies often signally fails, for the simple reason that the congestive state of the arterioles of the part, and resulting stasis of the local circulation, absolutely prevents the absorption of remedies applied for its relief; consequently no effect is produced. This is often seen in the treatment of furuncle and anthrax, where morphia, belladonna, etc., are applied locally without effect in quantities which ordinarily should produce a profound impression.

The conditions under which we have to deal with acute inflammation of the dental pulp are exactly similar in kind, but aggravated in degree, by virtue of the position of that organ, solidly encased in its unyielding tenement. While this factor is generally admitted, and reference to it may be regarded as "ancient history" by many, yet, from the fact that so many and diverse views are held as to the action of remedies upon and methods of treatment of the dental pulp when in a congested or inflamed condition, a renewed emphasis of the importance of this one factor would seem advisable, and particularly because of the interest which always attaches to the question of the best means for the painless devitalization of that organ.

That pulp-devitalization should be painlessly accomplished we all admit. Perhaps no one dental operation demands more care. A very large proportion of the patients who seek dental services for the first time are driven to our offices by exposed pulps which have sounded the first note of warning; and what can be more destructive of confidence upon the part of the patient who applies for relief from what may be only a slight "grumbling toothache" than to send him away with a maddening pain, which he may possibly have to endure for hours before the relief which he has sought comes? He has asked for bread, and we have given him a stone.

That the uncertainty attendant upon the question of painless or non-inflammatory pulp-devitalization has in general been charged to the character or composition of the "nerve-paste" employed, is readily seen when we consider the efforts which have been and are being made to correct the difficulty by alterations in the composition of the devitalizing paste. This is evinced by the multiplicity of formulæ now in use for the purpose, each containing arsenious acid, but variously combined with the whole category of available sedatives and local anesthetics, and each having its champion; many being "uniformly successful" with simple finely-powdered arsenious acid uncombined with any local sedative.

There is ample ground for the belief that a judicious combination of some active sedative or local anesthetic is of value in a devitalizing paste; but that, despite the greatest care, and without regard to the character of the paste employed, we will occasionally light up a violent pulpitis by our arsenical application, we have too often abundant evidence.

Experience seems to show that where extensive exposure exists, or hemorrhage has occurred, the devitalization is usually attended with the least discomfort; but even this rule is not inflexible, for the absorption of the arsenious acid may be followed by an attack of congestion and pain almost explosive in its suddenness, and of an intensity which will leave no doubt of the aptness of its characterization by the Scottish bard. A pulp in such a state of congestion is, so far as the writer's experience goes, absolutely beyond the reach of local medication for the relief of the attendant pain; but the violence of the congestion and pain can in nearly every case be controlled absolutely by local applications of cold. The following case will serve in illustration:

I filled with gutta-percha a large cavity in the distal surface of a lower second bicuspid for a lady patient about thirty years of age. The tooth had given no trouble previously, and remained perfectly comfortable for about forty-eight hours succeeding the introduction of the filling. About five o'clock on the second day after the filling was inserted she returned to my office suffering intensely from an acute pulpitis. The filling was removed at once, and a thorough exploration of the walls of the cavity was made with an exceedingly fine Donaldson's bristle. After some time, a minute exposure of the pulp, scarcely large enough to admit the point of the probe, was detected, and which had been overlooked when the filling was inserted. An application of sodium carbonate was made and sealed in over night. The pain subsided and the tooth became comfortable. When the patient returned, the following afternoon, she gave a history of pain which had started during the forenoon with a slight grumbling, gradually increasing in intensity until it became unbearable, and she came demanding the removal of the tooth. This I refused to do, but renewed the sodium carbonate, which failing to relieve I made an application of cocaine crystals, ground up with creasote to a thick, molasses-like consistence, without any perceptible effect. The pain still continued, as well as her frantic demands for the removal of the tooth. Being determined to conquer the difficulty if possible, I directed her to hold cold water in her mouth, gradually reducing the temperature of the water used by means of ice until she could bear the contact of small lumps of ice directly upon the tooth, not only without pain, but with positive comfort and

relief. The pain rapidly diminished until it faded out, and there was no return whatever. An arsenical application was then made, and she was instructed to again make the ice application to the tooth in the event of any recurrence of pain. This she did at a slight intimation of a recurrence about midnight of the same day, and it immediately ceased. Two days afterwards I removed the pulp complete without difficulty.

I have on several occasions, where severe pulpitis has already existed or has followed the arsenical application, been able to get it thoroughly subdued by means of the application of ice, and the subsequent devitalization has been effected painlessly. I believe that we have in these local applications of cold a valuable means for reducing the congestion of the pulp, thus enabling it to readily absorb the medicaments used in its treatment.

COLLAR CROWNS.

BY THEODORE F. CHUPEIN, D.D.S., PHILADELPHIA, PA.

It is perhaps generally admitted that the strongest way of mounting a crown on a root is by the Richmond method; that is, by having a band or hoop to encircle the root, with the dowel or pivot passing through the plate into the root; this plate soldered to the hoop or band, and the porcelain facing mounted on this foundation. While this arrangement is admitted to be nearly all that could be desired, and is the nearest approach of an artificial substitute to the natural organ, it is still open to slight objection. "*Il n'a pas rose sans épine.*" The gold band which encircles the root shows on the front, and thus gives a suspicion of artificiality; and, although the argument is put forth that the natural teeth are frequently filled at their labio-cervical margins, still the majority of those who have been unfortunate enough to lose their front teeth and have to wear substitutes—and these of the better class of the community—have a great aversion to the display of gold about their teeth.

It becomes the duty, then, of dentists who serve such patients to devise means for overcoming this objection, and we think that the best plan in fulfillment of this is the one proposed by Prof. W. F. Litch, which he terms the "collar crown," published in the DENTAL COSMOS (vol. xxv, p. 449), September, 1883. While this plan overcomes the objectionable feature of the other, by concealing the gold at the front, it cannot be said to be as strong as the Richmond device, although, when the direction of the force or strain upon the substitute is considered, it differs but little in point of strength.

We advance nothing essentially new, but only a new and, we think, a better way of accomplishing the same end.

Our first procedure in this operation is to place the rubber-dam over several teeth. Supposing the substitute is to be placed on the root of the left upper central incisor, we should punch six holes in the dam and inclose the six upper front teeth. In ligating the rubber on the teeth it is our custom to knot each ligature and let the knot rest on the palatal aspect of each tooth. By the aid of these knots the dam may be forced up well on the neck of the tooth to be operated on. Knots are placed on the ligatures on all the other teeth, for keeping the dam well in position and to prevent it from being pulled off, as well as providing a clean way of doing the work and a clear view of the case.

The face of the root and the canal are prepared as shown by the cuts (Figs. 1, 2) in Prof. Litch's article. By the time this is done and the foramen at the end of the root is properly sealed, it will be

FIG. 1.

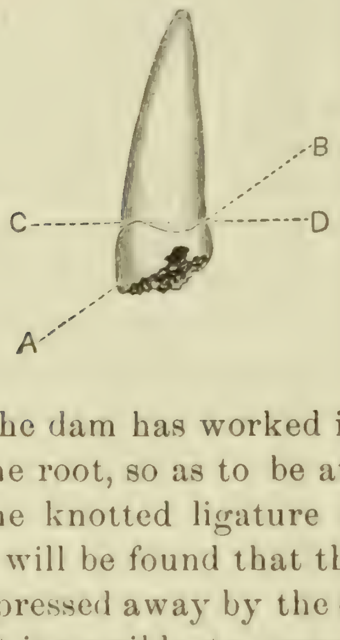


FIG. 2.

found that the dam has worked its way up over the remains of the crown on the root, so as to be at least a line above the enamel border, when the knotted ligature may be removed, and, perhaps, the dam; but it will be found that this is such an aid, and that the gum has been so pressed away by the dam, exposing the root so well that frequently it is possible to complete the whole operation with the dam in position.

Professor Litch recommends that a collar be made of thin platinum or gold plate and fitted to the palatal portion of the root, as shown in Fig. 3; that after the plate has been fitted to the face of the root, and the dowel soldered to it, the overhanging part of the face-plate be neatly nicked with small, fine-pointed scissors; the dowel placed *in* and the plate *on* the root, and the nicked parts neatly bent over the collar with a broad-faced serrated plugger, as shown in Fig. 4.

We were so favorably impressed with this plan that we tried it on several occasions, but we must confess that, besides consuming con-

siderable time, we did not, in our estimation, make as nice a crown as the plan seemed to promise, and we became more than ever convinced that the operations that look simple on paper are not always so when performed in the mouth.

It must be borne in mind that the little collar is made small and thin, and of soft metal, so that it is difficult to handle with the fingers; that it must be placed on the tooth where the enamel is as slippery as ice; that even a movement of the patient's head is enough to displace it; that the slightest variation from its exact position makes a faulty fit; that it must be held steadily and immovably in place with one instrument while the nicked parts of the face-plate are bent over on to it; that it has to be removed from the root, cemented together and replaced, to get it in exact apposition; that, should any of the cement get between the collar and the palatal part of the root, on which this collar must fit closely, there will be an inducement for the solder to find its way when the face-plate and collar are soldered together, thereby marring the fit. Besides, it is extremely difficult, with the utmost care, to so cleanse this minute piece of work as to make the solder flow over all points,

Fig. 3.

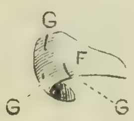
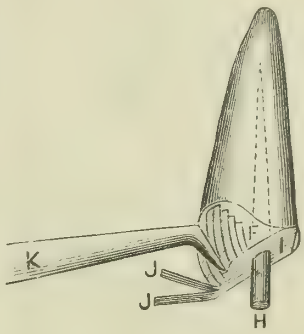


Fig. 4.



for the folds of the face-plate frequently lie one over the other, and the chances are that, in trying to clean away the cement thoroughly, the folds will be disturbed, or the collar moved or bent out of its position in the investment.

Regarding these as disadvantages in what we consider a good way of engrafting a crown on a root, we were induced to try the following plan for the accomplishment of the same end, which, though it may be open to objections, may have some points of simplicity commending it.

After the root-face has been dressed down as shown in Fig. 2, a piece of pure gold-plate of No. 30 gauge is cut as shown in Fig. 5. This is bent around the root, as shown in Fig. 6, the wide part resting against the palatal aspect, while the ends are seized with a pair of narrow-beaked, flat-nosed pliers at the labial aspect. While thus held, the band may be burnished to fit accurately against the ap-

proximal and palatal parts of the root. This done, it is removed and the ends soldered together, as shown in Fig. 7. This band is then replaced on the root, and, as it hugs the root snugly, any of the edges which may be higher than the face of the root may be ground down even with the corundum stump-wheel. It is again removed from the root and laid, with its upper edge downward, on a piece of pure gold plate of the same thickness, to which it is soldered, as in Fig. 8. The overhanging edges of the plate, as soldered to the collar, are now dressed down even with the collar, and the forward part of the collar filed away from the plate, as shown in Fig. 9. A hole is now drilled or punched through the face-plate to receive the dowel, which passes through it into the root. The under part of the face-plate at the hole should be well countersunk, so that the solder that binds the dowel to the face-plate may creep through and hold the dowel on its under surface. The face-plate and collar, as shown at Fig. 9, are placed on the root and bur-

Fig. 5.

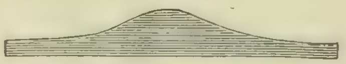


Fig. 6.

Fig 7.

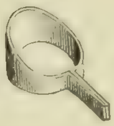


Fig. 8.

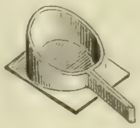


Fig. 9.

Fig. 10.

nished down to fit accurately at all points. A slight smearing of cement is placed over the dowel-hole, so as to fill the countersink, and the dowel passed through and secured to the face-plate with more cement. Before this hardens it is placed on the root in its proper position, after which the cement is chilled by a stream of cold water, when it is removed, invested, and soldered. Fig. 10 shows the collar, face-plate, and dowel complete. This being accomplished, the face-plate is slightly reduced on its labial aspect, so as to expose the root against which the porcelain facing is to rest. The protruding part of the dowel is now cut off level with the face-plate, and the porcelain tooth fitted to it. This part of the operation does not differ from that indicated by Prof. Litch, and therefore need not be repeated here.

The operation as set forth consumes much less time, is less tedious, does not demand the nice manipulative ability of the other, and is more certain in its results.

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

THE New York Odontological Society held its regular meeting Tuesday evening, June 12, 1888, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street.

The president, Dr. J. Morgan Howe, in the chair.

INCIDENTS OF OFFICE PRACTICE.

Dr. David Genese. Some weeks ago an elderly gentleman presented himself for the extraction of a number of teeth that had been worn down by attrition. He appeared to be in good health, yet he said he was under the care of a physician. After making numerous inquiries, I told him that he had better consult the medical man who had been attending him before I gave my advice upon the matter, for I learned that he had had an attack of paralysis some time before, and I feared the result that might follow the removal of so many teeth at one sitting. But the patient became very persistent, as the teeth had jagged edges which were beginning to irritate his tongue, and wished to have the operation commenced at once. I told him that I would consent to take out one tooth that was a little loose. That tooth being removed under a local anesthetic, hemorrhage commenced, and I suppose it was three-quarters of an hour before I could stop it. I saw no more of him, but learned that he died suddenly of paralysis about a week after the extraction. Now, had that gentleman fallen into the hands of anyone who was in the habit of giving nitrous-oxide gas, and those teeth had been all extracted at one time, no doubt they would have had a death in the chair. I find there is more possibility of severe hemorrhage from loss of teeth in elderly persons than in any other class of patients.

Dr. Frank Abbott. The case that Dr. Jarvie reported at the last meeting was discussed at that time before I came in. Hearing the report of it to-night reminds me of a case I had some eight or nine years ago, where I replaced a piece of the natural tooth itself which had been broken off. The lady was in Dr. Palmer's office one day last week, and he tells me that the piece is still in place. The operation was done by drilling two holes in the detached piece into which pins were cemented; a hole was then drilled into the dentine each side of the pulp, and after the pins had become solid fresh cement was applied and the piece pressed to place, the pins entering the holes made for them in the tooth. The pulp was not exposed. I have recently restored some broken teeth where the piece of the natural tooth

had been lost, in quite a satisfactory manner, as follows. I form a little three-sided cup of iridio-platinum, the broken end of the tooth forming the other wall: in the two corners of this cup I solder iridio-platinum pins, extending the distance I wish the pins to enter the tooth; then after taking an impression and making a cast, holes are drilled in the plaster and the cup set in position. The cup is made a little smaller than the piece should be when finished, so that the sides and end may be covered with body and enamel. I then hand it to a young man in Dr. Allen's office, Dr. F. J. McLaren, giving him the color of the tooth, and the shape of the other teeth in plaster. The result is a piece that fits in size and color almost perfectly. It makes a firm and solid piece of work, and is an easy way of restoring a broken tooth. Where the pulp is dead one large, square pin is used, instead of two; otherwise the operation is the same. In looking over my books recently I observed that at least fifteen years ago I made pieces of that kind and placed them on front teeth.

Dr. Littig. Would not that be a good way to crown a root?

Dr. Abbott. There is no reason that I can see why it would not. I once thought of getting up a crown on that principle, but have been too busy.

Dr. Dwinelle. Perhaps Dr. Abbott has performed those operations more artistically than I, but I have practiced the same thing for a long time. I recently saw a case of that kind that I did twenty-five years ago. I succeeded in making the joint between the artificial material and the natural so perfect, and had been so fortunate in selecting the color, that I was really deceived myself in trying to determine the line of joining, it looked so like a normal tooth in all respects. I simply took a section of an artificial tooth and soldered a little tag of gold upon it, ground it down to its proper conformation, and set it in its place with amalgam. We know that amalgam has no affinity for platinum and will not unite with it, so I had the tag made of gold, which answered the double purpose of adding strength and securing complete adhesion. I have quite a number of those cases. Recently I have changed my practice somewhat concerning them, following out a new idea which came to me. In adjusting these pieces of enamel it is difficult to get them exactly in place even after they are ground to fit perfectly, and they are liable to become displaced while packing in the amalgam or oxyphosphate. I therefore fill the cavity proper with wax a little stiffer than beeswax, and place the section of enamel in its place against the body of wax. I then cover the bit of enamel and its surrounding tooth-structure with osteoplastic cement, putting on quite a thickness of it. It sets in a few minutes, and forms an invest-

ment which holds all the parts in place while the filling is inserted. The additional advantage is that, if the joint is in any way imperfect, this cement will form in the place and remain there permanently. We know that the less cement we use the more perfect and permanent will be the adaptation. I now take out the wax and fill with amalgam or some kind of cement, but I prefer amalgam. After the amalgam has set, the shield may be removed and the tooth polished down. I so arrange it that the articulation beneath will come upon the amalgam rather than upon the section of artificial enamel. I have been surprised at my success in that method of restoration. I congratulate Dr. Abbott that he has been successful so long ago, and I feel a little proud in antedating him.

The President. Gentlemen, we will pass Incidents of Office Practice and listen to the first paper of the evening. I have the pleasure of introducing Dr. David Genese, of Baltimore.

Dr. Genese here read a paper on "The Conservation of the Deciduous Teeth and the Sixth-Year Molars. He cited a number of cases of children's teeth which had been under his care for several years, and exhibited models illustrative of them. He had made these cases a special study, and they had demonstrated to him the importance of conserving the deciduous teeth and sixth-year molars. Out of two hundred cases he had extracted but four sixth-year molars. He explained at some length his treatment in these cases where more or less decay was found associated with mal-nutrition. Litmus-paper was an important aid in diagnosis as to acid or alkaline conditions. He applied his remedies in a concentrated form, and avoided escharotics and pressure upon the pulp, always allowing ample time to elapse before excavating and filling.

[Vice-President Woodward now takes the chair.]

Dr. Weld. In the course of his remarks the doctor spoke of the use of litmus-paper. I would like to have him tell us how he would differentiate an acid mouth from an alkaline mouth, and what course he would pursue.

Dr. Genese. If it is a strong alkaline mouth I have found that boracic acid was the best thing to use. For acid secretions I have found phosphate of sodium and the bicarbonate of potassium exceedingly good. I find that I have very good results from the treatment, less sensitiveness, and very much easier work. In cases of exposed pulp I have been using a preparation of carbol (Nervine Vita) with four per cent. cocaïne; in every case of pulp-exposure I put on a capping of this preparation. A preparation of Caulk's oxide of zinc mixed with this carbolate gives good results. It forms a cohesive

paste that is insoluble in water, and which does not set for twelve hours, sometimes twenty hours; but it eventually becomes quite hard. In these sensitive teeth I could never proceed to fill cavities with any hard substance for several days; but on top of this substance, which becomes like the dentine itself, I can place amalgam of various kinds, or oxyphosphate; and where the cavities are not large I place gold. I find that in these very frail teeth with soft dentine amalgam wears a great deal better than any other material. To prevent the amalgam from oxydizing and the teeth turning black I first mix it with as little mercury as possible, wash it in a twenty-five per cent. solution of sulphuric acid, and then with warm water. I then dry it off, put a little alcohol on and dry it again, and then remove the excess of mercury by pressure. The amalgam sets very rapidly, packs closely, and you can invariably finish and burnish the filling at one sitting.

Dr. Brockway. You spoke of using certain remedies to neutralize the acid condition of the mouth. Will you please tell us what they are and how you apply them?

Dr. Genese. Either phosphate of sodium or bicarbonate of potassium, in the form of dry powder, is placed in the cavity of the tooth and sealed up with wax. After the powder is used in this way there will always be a diminution of sensitiveness; while the carbolate or "Nervine Vita" may be put immediately into an exposed pulp, giving instant relief, it being sealed from fluid or air.

Vice-President Woodward. Gentlemen, if there are no further remarks to be made, we will pass to the paper of our president, Dr. Howe.

J. Morgan Howe, M.D., M.D.S., here read a paper entitled "A Study of the Practice of Filing and Extracting Teeth, for Real or Alleged Benefits."

[Dr. Howe's paper will be found under the heading of "Original Communications," in this issue.—Ed. Dental Cosmos.]

Discussion.

Dr. Perry. If I have been greatly pleased with Dr. Howe's views in reference to retaining the perfect shapes of the teeth, I have been more than pleased with his management of the sixth-year molars. The paper is full of evidence of close observation, and of that level-headed quality that has enabled him to present his facts so that they stand in right relation, and as we see them daily. No young man has a right to be heard on such a subject. A man must have had ten, fifteen, or twenty years' experience before he should venture an

opinion on such a subject. It is the beginning of science when cases are shown as these have been,—with models that show the exact conditions after years have gone by.

Dr. Atkinson. I don't care how smart your young man is, he has to have fifteen or more years' experience to render him an expert; and that is not saying that all the old men know what that means. The great difficulty is, as has been so beautifully animadverted upon in that paper, that we have been jumping at conclusions. I rejoice with Dr. Perry with exceeding joy at the beautiful luminosity of the subject that has been presented by the president of this body. It is my judgment that it is the most analytical and complete yet modest paper on the subject that I have heard. And that does not take, in my estimation, any of the credit from Dr. Davenport for what he did in the same line; for he said he was not attempting to present all of the subject, but was simply showing certain points, and he has drawn them out so clearly as to bless us with what we have heard to-night. If we could have "Systems of Dentistry" with such papers as that in them they would be of some service, and worthy of indorsement. I'm not a last year's chicken in the sense of years; but I hold myself to have hardly chipped the shell yet of the real luminosity that is just about to burst upon us when we shall come together to hear such papers as that. There has been a great deal said in the last few years to the effect that we are nothing but dentists. If we were dentists, that would be enough; but the point is this: to be a dentist you must have anatomy, physiology, pathology, therapeutics, and mechanical adaptation, and understand exactly how to bring about results that will eventually become fixed and formulated demonstrations, if the lead shown us to-night shall be followed by earnest men.

Dr. Jarvie. I hardly have words in which to express my commendation of this paper. I think, as Dr. Atkinson has said, it is one of the ablest and most complete papers upon this subject that I have ever heard or read; and it has touched upon some points that I do not remember to have seen mentioned in any former paper. Dr. Davenport's paper was a most able one, and he has our thanks for the great amount of labor and time spent in making his investigations, and for presenting the results of those investigations before us. He gave us a great deal that was new and valuable in showing the movements of the teeth under certain conditions, and he presented that phase of the subject more fully than it ever had been, but in reading the paper and studying it carefully it did seem to me that there were certain things lacking. Dr. Davenport did not go far enough, but left us to believe that the conditions he presented were those usually met with, and I did not feel that that was correct.

The paper we have heard to-night just supplements and completes the paper given us by Dr. Davenport.

There are two points in Dr. Howe's paper that I want to speak of; one being that there are certain cases of irregular conditions of the teeth presented to us where the simple extraction of a tooth will result in almost a perfect denture in appearance, whereas if all the teeth were left in the mouth they would be very obtrusive indeed. I wish I had time and opportunity to show you some half-dozen models bearing upon this subject. I treated a case this winter of a young lady with regular features, and a beautiful set of teeth so far as their shape, material, and color were concerned, but the left superior cuspid was very obtrusive and gave a coarse appearance to a face that would otherwise have been refined and pleasing. The occlusion of the teeth, with the exception of this cuspid and the adjoining bicuspid, was almost perfect. I extracted the first bicuspid, thereby allowing the cuspid to drop into a less prominent position, the result of which was to greatly improve the young lady's appearance. No appliance was used, and the usefulness of the extracted tooth was not lost, for it is doing service now as an implanted tooth in the mouth of a gentleman.

Another case that I want to speak of is that of a sister of this same lady, about nineteen years of age. Her teeth were very similar in structure and shape to her sister's, but the right superior central was unduly prominent, being forced forward outside of the arch. Some three years of that young lady's life, she said, had been spent in a dental office: she had had her teeth regulated two or three different times, and they had reverted to pretty much the same type of irregularity that they presented in the beginning, but not quite so prominent. Extraction of the superior right first bicuspid, and a little appliance, changed entirely the expression of the mouth. Certainly these are cases where extraction is not only justifiable, but where it would be almost criminal not to extract.

The other point that I want to speak of is the wisdom-tooth as a factor in the treatment of irregularities. I would like to have presented three models that would show just the reverse of what is shown by models A, B, and C. The case is one of a girl of thirteen that I had in charge when I first commenced practice, and I had been taught that it was a crime to extract teeth to overcome irregularities; therefore I saved all the teeth, and secured an expression of "too much teeth," to use Dr. Howe's phraseology. Still they were all regular, and I considered the treatment very successful. The retaining-plate was worn for some time, and the teeth remained in the position in which they were left for perhaps four or five years. When the lady was twenty years of age a gradual change

came over the arrangement of the teeth, and in the course of two years they had gone back to the original type of irregularity, though not quite so pronounced as they were originally. The eruption of the wisdom-teeth had brought about the change. From that time I have taken into consideration the wisdom-teeth as a factor in correcting irregularities; and I do not believe we can ever permanently correct a case of irregularity where the jaw is large enough for facial symmetry, but with teeth too large for a regular position in the jaw, without some extraction. I think that in all cases of irregularity we ought to take into consideration the force exerted or to be exerted by the wisdom-teeth, and I think we will find it is much more of a factor than we have usually thought it to be.

Dr. Abbott. In the admirable paper of our president to which we have just listened he informs us that judgment is necessary in the treatment of cases of this particular kind, in a manner indicating that there is something better to rely upon. What can this be instinct or "ghostism"? As an uncertain or unreliable factor, the wisdom-teeth play a most important part. Now, it seems to me that we are in as bad a position, so far as our ability to proceed understandingly in any given case is concerned, as we were before. It is utterly impossible for me or any one else, in the case of a child of from nine to fourteen years of age, to tell whether there are to be wisdom-teeth or not. In hundreds of mouths they never appear; and there are hundreds of cases where the first molars have been extracted where it would have been a great blessing if they had been left alone, on account of the non-appearance of the wisdom-teeth. The uncertainty of the presentation in any form of the wisdom-teeth should be enough in my judgment to deter dentists from the reckless or indiscriminate use of the forceps upon the first molars.

Dr. C. A. Woodward. What percentage of wisdom-teeth does Dr. Abbott think never make their appearance?

Dr. Abbott. I give it up.

Dr. Genese. In regard to the wisdom-teeth not appearing at a certain time, I had a case presented a few weeks ago of a lady suffering from neuralgia in the face, who had no teeth but was wearing full upper and lower dentures, therefore I could not at first find any cause for it in her mouth; but one spot near the median line of the soft palate showed considerable redness and irritation, and upon examination with a probe I discovered a hard substance behind it which I suspected was a tooth, and which proved to be a wisdom-tooth. The lady was about thirty-three years of age.

Dr. Abbott. Allow me to present to you a case (one of our members) which illustrates the point. He had his first molars extracted

when he was young, and ever since he has been obliged to masticate with the second molars and bicuspids, the third molar being nothing but a peg, too small to be of any use.

Dr. Clowes. Our friend from Baltimore exhibits some casts of adult jaws, showing the absence of permanent cuspids and the retention of their temporaries in good order. He would have us infer a wise discretion and a rare good fortune in the escape of these teeth from extraction. There is little reason to congratulate him on the correctness of his conclusions. A youth of nineteen, whose right superior cuspid gave no evidence of eruption, came to me many years ago in reference to the matter. The temporary still held possession, and distinguished members of the profession had advised letting it alone, saying, "It will not do to risk extraction; another tooth may never replace it. Better have that than none." I wanted a permanent cuspid to match a beautiful one on the left: so earnest was my desire that I fairly longed for it, and resolved to go in pursuit. With a minute probe I pressed steadily upward and inward through the gum and alveolus to a point just beyond the apex of the temporary root, and *struck enamel!* This was interesting, and brightened my way for further discoveries. I queried with myself as to the next step to take. The deciduous obstructor stood in the way of progress, and I extracted it at once. With this removed, I regarded the case as an incident in "oral gardening," and proceeded to mellow the soil around my dental plant that it might sprout and grow. It was bone-stayed and gum-bound, but yielded readily to culture. There have been many dental pearls, in all generations, bound in bony cells, that awaited only an inventive mind and benignant touch to bring them to the light. In his excellent paper Dr. Howe has singularly vindicated the propriety of extracting sixth-year molars. While some of his remarks would seem to deprecate this practice, his apt illustrations when published in the DENTAL COSMOS will be his enduring defence. The case, showing excessive separation,—presumably from extraction and recession,—presents the worst features by a palatal exposure. The cast does it better justice, and brings to view a very satisfactory denture not only separated but saved.

While great value is ascribed to first molars and a proper occlusion among teeth, the greater matter of absolute safety is but little considered. Approximal cavities are the terror and trial of our lives. We work and worry over them until our nerve-centers tingle from exhaustion, but we do not strive as we should to prevent as well as cure disease. One grand stroke, one righteous act of judicious and timely extraction, would give us victory. Contact, acids, and alkalies as well, are inimical to human teeth, and we may render

them powerless if we will. "*Whenever two teeth are found naturally apart, they are sound and will remain so; whenever two teeth are found in contact they are decayed, or in time will be likely to decay.*" It was not always so. In the primal years of my practice caries was of a dark aspect and slowly progressive, but now, in the whitened pit of bleached dentine, we see a more ruthless and hasty solvent.

These are the lessons you may read in the many mouths that come under your control. Be active, then, and vigilant to perceive. Having eyes to see, open them to the truth, and as you comprehend it, declare boldly the way of salvation.

Dr. E. A. Bogue. Mr. President and Gentlemen: When a paper of such excellence as Dr. Howe's carefully considered effort is presented before us, our tendency is not only to concede his facts (for we are obliged to do that), but to accept his conclusions.

I am glad, therefore, that he has not reached any conclusions excepting that "the facts represent invariable principles," and that he hopes "to have these facts become part of the foundation for future intelligent practice." In all essential particulars save one he does not disagree with what Dr. Davenport said in his paper, and that one is as to whether nature supplies man with complete dentures. Dr. Davenport aimed to strike at two points of common dental practice: the most common of these two is filing teeth, that being practiced for patients of all ages, and that Dr. Howe has emphatically condemned, and I believe all here present condemn it except Dr. Clowes; the other is extracting teeth for patients still in their early youth, whose dentures are not abnormally irregular, for the purpose of making larger separations; both of those operations being performed with the idea of making permanent spaces, and in the hope of averting decay. If the idea of filing be condemned in toto, as I understand Dr. Howe to condemn it, I do not see why, if followed to its logical sequence, he should not also condemn extraction for the same purpose.

Dr. Howe. That is one of my conclusions, when there exists no other reason for extraction than a desire to make spaces.

Dr. Bogue. Well, if this be admitted, we have only the question of extraction for regulating, or for esthetic effects, to consider at this time, that being a different subject from that of Dr. Davenport's paper, and Dr. Howe may be counted among the supporters of the theory that natural forms and positions are the best for preserving the teeth in their greatest efficiency for the longest time.

Dr. Howe. Dr. Davenport's paper contains a special protest against extraction for irregularity, claiming that extraction for prominence of the front teeth will generally produce an increase of such deformities, by means of shortening the bite. In regard to

the Figs. 6, A, B, C, I call attention to the fact that in that case, as well as in Fig. 5, there has not occurred a shortening of the bite, which Dr. Davenport says or implies is unavoidable. The same fact is noticeable in Dr. Brackett's cases, and if the rule is as asserted and these cases, in which no shortening of the bite has followed the extraction of first molars, are exceptions to the rule, then the rule needs to be proven, just as the facts in these cases are proven. I do not know enough yet to lay down rules or make generalizations, and I do not admit that the premises laid down in Dr. Davenport's paper are a sufficient warrant for his doing so. I say this without the least intention of disparagement, only wishing to insist on the broadest foundation possible, before we begin to formulate principles.

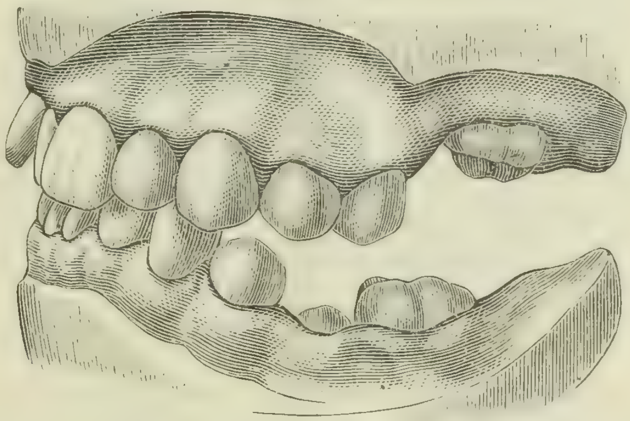
Dr. Bogue. Dr. Davenport's words upon this subject were: "We need not hope to improve deformities *at the front of the mouth* by the extraction of the first molars, *when there is a marked forward inclination of the front teeth, including the bicuspids.* The overcrowded front teeth will usually retain their position, owing to the increased bracing caused by the shortened bite. But if such overcrowding is at all relieved, it can only be by a forward movement which increases the forward projection of the arches, and the production of a deformity worse than the one sought to be corrected." But he also says, "While admitting the value of extraction as a means of correction of certain irregularities of the teeth, I am forced to believe that far more irregularities have been *caused* by extractions than could ever have been *corrected by extraction*."

Dr. Howe disputes the proposition that "Nature has furnished man with two dental arches, so formed and so placed in relation to each other as to be best supported at every point, while permitting all the movements necessary for the perfect comminution of his food." This quotation does not refer to the man who is obliged to seek aid at the hands of dental art, but to man in general.

To correct the dental deformities of the man who seeks our help we need to study the ideal man and the reasons why each line and curve and groove exists in the dental arcade. Then we can see, perhaps, the way in which these perfect adaptations became imperfect, and so find the way back again towards perfection. I necessarily know something of Dr. Davenport's paper, because we sat up nights at its making, discussing its various points; so I know what brought it out. If I may be allowed, I would like to read an extract from a personal letter received from Dr. Davenport some weeks after the publication of the discussion upon his paper. "A few saw the purpose of the paper (I am more than grateful): they saw that it dealt in principles; that it was not intended to explain directly, immediately, and on the spot, every wrinkle in the distorted face belonging to a

mutilated jaw or dental arcade, or to settle at once and for all time the best means in every case for the prevention or regulation of every form of dental irregularity: nor to determine the force of all the questions of development, of individual and race peculiarities: nor all of the questions of the loss or preservation of the teeth, and many other things besides. It did purpose to establish certain principles which might serve as something like a basis for the intelligent discussion of the many questions which naturally rest upon such bases, but which questions themselves for the most part could only be alluded to in the paper." This case (Fig. 1) that I now show you was one of the incitements of the paper. This is not a case of antiquity, but only of 1885, a case that came from the hands of a gentleman in New York who makes as handsome gold fillings as I ever saw; a graduate of a dental school; an upright, honest, and true man. The operator could not have done that thing had he looked at the articulation of the model before he gave his advice. He took out the two upper molars, hoping thereby to regulate the front teeth by causing them to fall back.

FIG. 1.



Dr. Brockway. Were they good teeth?

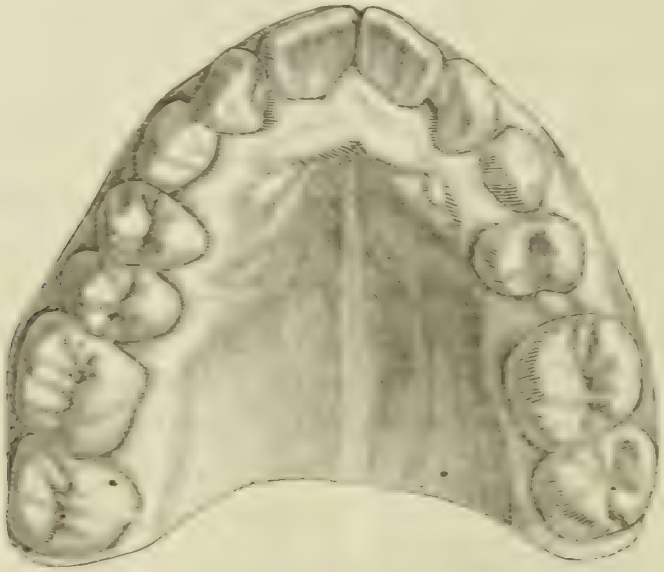
Dr. Bogue. It was a beautiful set of teeth, save for the irregularity of the two incisors; clean and in good order. That is exactly as the case came to me from the hands of the dentist in New York. With that occlusion the child could not masticate at all. I had to make a rubber plate for her to chew upon for a year or two.

Dr. Jarvie. Might there not have been some explanation of the circumstances connected with the extraction of these sixth-year molars? I have seen cases where the sixth-year molars were good for nothing, all the other teeth being good.

Dr. Bogue. In this case all the teeth were good. The upper molars were taken out in the hope that the incisors and cuspids, as well as the bicuspids, would fall back. They do not generally fall back, though they sometimes do. They did not in this case. The dentist should have expanded the arch; he actually did contract it.

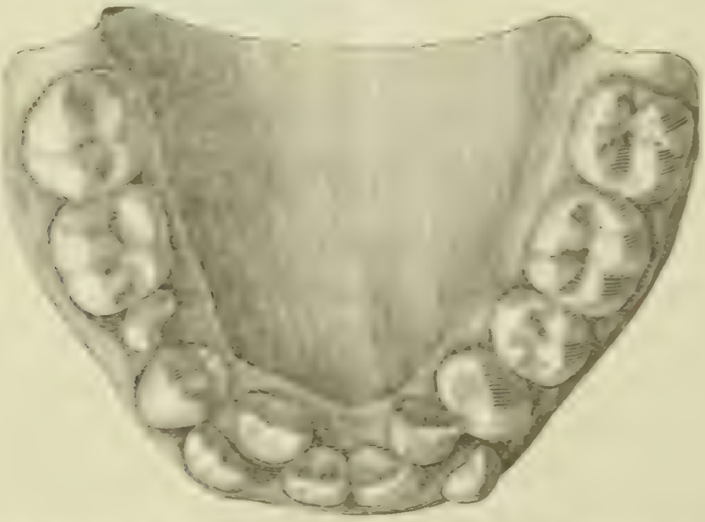
He did exactly the wrong thing. And here I may say that it was only after committing these errors myself that I began to look at these cases of other practitioners, and to have my eyes opened to the enormity of my own sins, as I saw the results of other men's mistakes, that came to me sometimes ten, fifteen, or twenty years afterwards.

Fig. 2



Here (Figs. 2 and 3) is the model of the mouth of one of my patients at thirteen years of age. This case was taken for consultation to at least six practitioners in New York in whose judgment I had confidence. I tried to see several others, but did not find them at home when I called. The preponderance of advice was for extraction. I

Fig. 3.

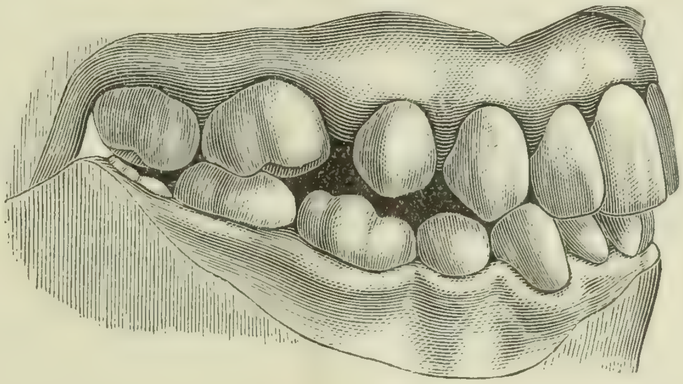


could not bring myself to extracting the molars, but did finally agree that the best thing was to extract the second bicuspids. See how lamentably I erred in this case, and my advisors as well. Here (Fig. 4) is the model at sixteen and a half years of age. It will be seen that, in dropping back, the upper bicuspids have also dropped

inwards. The angles of the mouth are lacking, and the face presents a narrowed appearance that detracts greatly from its forcefulness. The articulation of the teeth up to this point is so poor that mastication is very imperfectly accomplished, and the child herself complains of her lack of ability to chew. Approximal decay has appeared in all the crowded spaces. I need not pursue this painful subject further, to show you that I have some cause to criticise, not my own judgment only, but that of the profession at large as here exemplified.

This cast represents the mouth of a young gentleman twenty-four years of age. The cast was taken in 1885. The sixth-year molars were extracted at twelve years of age by a fellow-practitioner in New York. If any one can show a more perfect occlusion than that I should like to see it. But for a young man the incisors and cuspids show too much wear; the wear is equal to that which we should expect to find in the teeth of a man of forty-four, and

Fig. 4.



between all of the back teeth above and below and all of the incisors above approximal cavities exist. Extraction proved to be a complete failure in the matter of obtaining permanent spaces or of preventing decay, and yet the teeth are of excellent quality and shape.

Dr. Lord. Why were the teeth extracted?

Dr. Bogue. In the hope of leaving spaces between them, I was told.

Dr. Brockway. To what does this lead?

Dr. Bogue. A shortening of the bite, that seems to me unavoidable, and with it a straightening of the curves of the masticating arches until the straight line that characterizes the temporary arches results, and the permanent teeth are made more temporary.

Dr. C. D. Cook. It seems to me that looking back is one thing and looking forward quite another. In our practice of twenty or thirty years ago we were probably acting up to the light which we then had, and so I infer we have been since. We are all honest men, but we have been getting a little light in the last ten years which did

not shine out so brightly twenty or thirty years ago. We hadn't the facts to go upon that we have now, or they were not demonstrated facts. If Dr. Clowes were here—I see he has left the room—I should like to ask him why he continues to extract teeth that we now see ought to be left alone.

Dr. Bogue. I most fully concur with Dr. Cook in what he has said: and I would repeat that it was precisely those points which had been generally accepted by the profession, and passed over for years without further observation, that came like an avalanche to startle me in Paris. Intimations have been made that Dr. Davenport was bolstering up his views with chosen cases. Now, Dr. Davenport has just nine specimens to illustrate his paper, and those nine I believe are only an average of the two or three hundred casts that I have here in New York, many of which were sent on from Paris from Dr. Davenport. I brought to the meeting a year ago, when his paper was read, perhaps one-third; the other two-thirds are at my house, and I should be delighted to show them to the members of this society. It is a wonderful exhibition; and I don't believe that those nine cases would represent anything more than a fair average of the whole lot of casts taken. It is perfectly true that a good many patients come in for whom no casts would be taken, and no special notice would be taken of them; but those that did call for notice were investigated, and casts of them will be found in the collection.

While conceding, as I do, that extractions of teeth may be best, even as amputations of legs and arms may be best, let us consider the reasons why spaces of any kind should not be made between the teeth; then, if the reasons for making spaces, either with the file or forceps, overbalance those for not making them, it is clearly our duty to make those spaces.

The reason why spaces should not be made between teeth are:

1st. They cause recession of the gums.

2d. They promote crowding of food and calculus beneath the gum.

3d. They promote approximal decay.

4th. They diminish sometimes to the point of almost complete loss the masticating surface.

5th. They diminish the size of the mouth as to the arches, decreasing the size of the muscles and shortening the space between the nose and chin.

6th. The alteration has a tendency to weaken the expression, to detract from its dignity and strength.

7th. It diminishes the dome of the palate so as to preclude the possibility of first-class vocalization, for without a full and deeply rounded arch of the palate a full, sonorous vocalization is impossible

either for speaking or singing, and this rounded arch cannot co-exist with the diminution of its size.

8th. It frequently causes the lower incisors to impinge upon the upper in such fashion as to prematurely wear them, or else cause them to project and sometimes to separate.

9th. In cases where the lower incisors lean backwards it renders the filling of approximal cavities extremely difficult if not impossible.

10th. It renders the placing of the rubber-dam on lower teeth that have leaned forward so difficult that extraction is sometimes resorted to rather than filling.

11th. It renders thorough cleansing of the teeth difficult and sometimes impossible.

Dr. Howe. There are three points in the paper to which I will call special attention. First, that extraction of teeth merely for the purpose of producing spaces, without other reason, is not justifiable nor successful. Another point is that, with undue prominence or irregularity of the six anterior teeth, extraction of first molars has resulted in a falling back of the former, and no shortening of the bite can be detected, and in one case there was an increase in the length of the bite. I challenge a close inspection of the models, for I believe I have seen an increase in the length of the bite in other cases. And then I would call attention to the proposition that in order to form an accurate opinion of the results of extraction in any given case, the previous conditions should be known.

Dr. Bogue. Dr. Howe is quite right in saying that in neither of the cases shown in Figs. 5 and 6 was there any perceptible shortening of the bite, yet I believe there was an actual shortening, and that a more careful study of these two cases would either show such shortening or else would show an inherited condition that would have become a serious deformity had those extractions not taken place.

In conceding the apparent good results that we see here, I am more than ever impressed with the difficulty of exercising without more knowledge than we yet possess any good judgment previous to operating. But in this I am only again agreeing with Dr. Howe's convictions.

Dr. Howe. Such radical mistakes as Dr. Bogue has shown to-night average well with those presented by Dr. Davenport, and are sufficient to convince us, I think, that the profession has its full share of incompetents; but such evidences need not influence our judgment so that we lose sight of some benefits to be obtained by extracting teeth,—conceded to be an evil, but sometimes the least evil. Of course the study of the perfect denture is of the greatest value, in the direction Dr. Bogue suggests, and Dr. Davenport's

work has my highest appreciation; but it seems to me quite as necessary that we consider the imperfect denture, whose poor possessor, Dr. Bogue argues, is not intended to be included in the designation "*man*." I understood Dr. Davenport to intend—as he says in the letter quoted—to establish certain principles; but it does not seem to me that the premises—including the perfect denture and the results of mistakes in extraction—are a sufficiently broad basis on which to establish his conclusions. Indeed, I think some of them are already disproved. Allow me to say in regard to the quotations offered by Dr. Bogue, that I did not regard these sentences as a material modification of the position of extreme opposition to extraction taken by Dr. Davenport, which seemed to me to be epitomized in his question, "Why extract at all?" If in this I failed to understand him, I shall be glad to know it, and gratified to find myself more in harmony with his views.

Adjourned to meet at the residence of Dr. Francis, Glenbrook, Conn., the following Thursday, in compliance with his invitation, at which time the subject for discussion will be "What Professional Men Need."

S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

PENNSYLVANIA STATE DENTAL SOCIETY.

(Continued from page 594.)

At the afternoon session of the meeting of the Pennsylvania State Dental Society, June 6, 1888, C. N. Peirce, D.D.S., read a paper entitled

Eruption of the Permanent Teeth.

In writing of and tabulating the eruption of the permanent teeth, it is a matter of considerable clinical interest to recognize the early date at which these teeth begin their dentification, so that it may be recalled when teeth are met with in which calcification is very imperfectly performed. Dental histologists have shown that as early as the fifteenth week of embryonic life preparation is made for the development of the four first permanent molars, and following close upon these, in the sixteenth week, is the inflection giving rise to the enamel-organ for the twenty anterior permanent, the successors to the twenty deciduous teeth; and from this period until the birth of the infant the germs for twenty-four of the permanent teeth are passing through their several progressive stages preparatory to receiving the salts of lime. At birth, then, the child has not only the twenty deciduous teeth largely advanced toward calcification,

but also has the germs of twenty-four permanent teeth, in twelve of which calcification commences the first year. The germs of the second permanent molars make their appearance the third month, and that of the third molars (wisdom-teeth) the third year after birth.

The permanent teeth, unlike the deciduous in embryo, are during the periods of calcification constantly subjected to the influence of morbid systemic conditions, and any abnormal nutritional influence of even a few weeks' duration, if occurring during the period of coronal calcification, is sure to make an impression upon the crowns of the teeth which are at that time undergoing this process; markings or structural defects being located at the point of calcification, and limited in extent or modified by the severity and duration of the systemic abnormality occasioning it.

If any serious nutritional disturbance occurs prior to the fifth year, the defect will be observed upon the incisors and first molar crowns, varying in location with the age and advancement of calcification. If prior to the seventh and after the third year, it would be seen on the crowns of the cuspids, bicuspids, and second molars; occurring between the eighth and twelfth years, it would probably produce some malformation of the third molars. This influence of the general health upon the teeth, inducing vices of conformation, may be assigned as a very important factor, favoring the premature loss of this, the third molar. Development in it proceeds or is protracted through a period of childhood when the system is liable to frequent and prolonged attacks of mal-nutrition, which must unavoidably interfere with perfect calcification. While the permanent teeth in their eruption rarely produce such suffering and disastrous consequences as frequently accompany temporary dentition, there are times when the cuspids and bicuspids are so retarded in their eruption by either the persistence or the premature loss of their deciduous predecessors, or by a contracted condition of the maxillary bones, that serious trouble results. From induration of the gums or non-absorption of the anterior portion of the ramus or tuberosity, the first, second, or third molar may also be the cause of much local inflammation and a febrile systemic condition; and this is especially the case where there is an impacted third molar.

PERMANENT TEETH COMMENCE CALCIFICATION:

25th week of fetal life, enamel and dentine of first molars begin calcification.
First year after birth, central and lateral incisors begin calcification.
Four years of age, cuspids, bicuspids, and second molars begin calcification.
Eight years of age, third molars begin calcification.
Sixth to seventh year, the 4 first molars are erupted.
Seventh to eighth year, the 4 central incisors are erupted.

Eighth to ninth year, the 4 lateral incisors are erupted.
Tenth to eleventh year, the 4 first bicuspids are erupted.
Eleventh to twelfth year, the 4 second bicuspids are erupted.
Twelfth to fourteenth year, the 4 cuspids are erupted.
Twelfth to sixteenth year, the 4 second molars are erupted.
Sixteenth to twentieth year, the four third molars are erupted.

By the commencement of the sixteenth year the above table completes permanent dentition, with the exception of the third molars or wisdom-teeth. The variability of these is great, for while they are not unfrequently in position by the seventeenth year, they are often unerupted at twenty-five, or sometimes delayed until the thirtieth or fortieth year. In this greater delay the absence of room in the arch is usually the cause, and not until some of the more anterior teeth are extracted and the alveoli absorbed do they make their appearance. The cuspids and second bicuspids are also less uniform in their eruption than the incisors. This may be due to either the persistence or premature loss of their predecessors. If the deciduous cuspid be prematurely removed, the first bicuspid, which makes its appearance two years before the permanent cuspid, will move forward and take its position adjoining the lateral incisor. This necessitates the delay of the permanent cuspid some months, and when it does erupt it must encroach either on the labial or palatal surface. A similar condition results from the early loss of the second deciduous molar. The first permanent molar coming through the gums more than four years before the second bicuspid, the premature loss of the second deciduous molar would enable the first molar to occupy the space which should be protected for the bicuspid, and force the calcification of the latter to be completed beneath the crown of the first deciduous molar, or else occupy a position encroaching upon either the buccal or lingual territory.

The associate lesions of second dentition are regarded as of trifling importance. Yet not unfrequently do conditions exist at this period of the child's life which result in very serious constitutional disturbances.

A want of correspondence between the growth of the root and the removal of the superimposed structures may result in stomatitis, enfeebled digestion, impaired nutrition, and fever. Wherever the terminal branches of the trifacial are distributed, suffering, severe and protracted, though quite remote from the seat of the disturbance, will until the cause is removed baffle the best efforts of the physician to relieve. The persistence of either the inflamed and swollen or the indurated gum over the crowns of the advancing first, second, or third molars, retarding their eruption and pressing the sharp edges of the calcifying roots back into the uncalcified

pulps or formative papillæ, cannot do less than encourage, if not produce, disorders of too serious a nature to be disregarded, and second to those of first dentition only because the increased age has lessened the child's liability to disease, and increased its nutritional advantages and its resisting power. An impacted third molar at the base of the coronoid process is capable of giving as much excruciating and persistent suffering as it is possible for human nature to endure. Indeed, there is no abnormality or lesion coming within the province of the oral surgeon which demands more prompt action or for the time more thoroughly taxes to the utmost his best judgment and skill. The removal of the anterior molar is often indicated for the purpose of giving relief; indeed, when the third molar is imbedded so that it cannot be reached, it is the only remedy. The cause of this serious abnormality has never received the attention it deserves, and has been looked upon rather as a freak of nature than as a natural result of some potent cause.

The impaction of the third molar, so much to be dreaded in certain constitutional predispositions or idiosyncrasies, is invariably the result of one of three important factors,—heredity, variation from some nervous impression, and external action or want of action, with its accumulated influence, which we may term function of teeth and maxilla. The tendency of children to inherit physical peculiarities from ancestors, both near and remote, is so well established that it needs no argument to enforce it. The certainty with which a sixth finger is reproduced upon the hand of some members of the family is proof of the law transmitting physical peculiarities. The influence which the nervous system exerts upon the teeth and jaws is certainly well attested by their concomitant variations with the greater or less nervous energy displayed.

The period of life when the brain is overtaxed or unduly stimulated, when the irritability of the nervous system is prominent in every act or movement, is a period well marked by inharmony of function and imperfect physical development. Recognizing the fact that the trigeminus, in the fulfillment of its functions, regulates and governs the nutrition of the tissues to which its terminal branches are distributed, we can readily appreciate the following statement made by the late Professor Anstie: "The nervous center in which the trigeminus is implanted is, of all nervous centers, the one which in the human subject is most liable to congenital imperfection of the kind which necessitates a break-down in its governing functions at special crises in the development of the organism." Dr. Kingsley, in his work on "Oral Deformities," says, "No author on the causes of malposition of the teeth has made this direct connection between the abnormality and a disturbance of the nerve-

center during the formative and eruptive period; but I find a large array of facts, confirmed by my own observations, which point, in my mind, to this only conclusion; and, although other observers of similar facts have attempted in many instances an explanation of what they saw, they have failed to refer them to any satisfactory *primary* cause." The influence exerted by action or want of action, use or disuse, would come under the head of "functionally-produced modifications." That these do occur every observing biologist who has written within the last century certainly recognizes. The decrease in the size of the jaw of civilized men from that of the uncivilized or lower races is well attested, and the cause of this change in size or modification in development can only have resulted by or through the agency of two important factors, with their cumulative influences, decrease of function and diversion of nutrition. The modification in diet and stimulation of the brain necessarily lessens development in the one, and, by diversion of the nutritive current, exalts the other. A change of *habitat*, which involves new food, different temperature, drier soil, must produce a corresponding change in the digestive, respiratory, and vascular systems; and these, of necessity, must in time result in modified structural conditions.

This brings us directly to another and not less important question,—one which has quite recently occupied the minds of many of the ablest in the profession. I refer to the *extraction versus the preservation of the first permanent molars.*

Discussion.

Dr. Sudduth. The question of heredity is one of vital interest, it seems to me, and one to which I have given much attention. The point made by the essayist is a good one. In many cases, if we had a knowledge of the previous family history of our patients, we would be enabled to see which course would be best for us to take to save trouble. My studies have brought me to the conclusion that man is a creature of circumstances, and that he has a predecessor, and that the predecessor was a better man physically, at least, than the man of the present is. Every part of the organism has been subject to the influence of disease, and the sixth-year molar not less than other organs. This tooth seems to have an especial tendency to decay, and in many cases cannot be saved for a very long time; but as its presence, at least during the time while the teeth contiguous to it are being erupted, is necessary to insure against the contraction of the jaw, I would never extract it unless I had some very positive reason for doing so.

Dr. James Truman. Dr. Peirce's paper opens up a large subject,

and one that is very frequently discussed, sometimes I think with very little profit. I do not agree with him that if the jaw through the civilization of the race is decreasing in length, it follows that we must lose a tooth to accommodate the decrease in size. My belief is that the teeth will and do decrease in size with the advance in civilization just as certainly as the jaw does. If we look at the teeth of the anthropoid ape we find them larger than in the human, and if we examine the oldest skulls which have been found—the cave skulls—we will find the teeth larger than those of the present race of civilized people. The same thing may be observed in the savage races of those now peopling the earth. As the people become more civilized the size of the teeth will diminish, and I do not think we should lose a tooth. I regard the sixth-year molar as of great importance; it is the key of the arch, and to destroy it will impair the arch. When you remove the sixth-year molars the front teeth move back and the posterior teeth move forward; so it amounts to removing the sixth-year molars for the benefit of the wisdom-teeth. In the course of time the teeth will regulate themselves, the change in the race consequent upon civilization will be completed, and the parts will be suited each to the other, and then the sixth-year molar will hold its place.

Dr. Guilford. We will find, upon examining the teeth of the present generation of men and the ancients, that the malposition so frequently found now is a thing of to-day. The teeth in the cave skulls showed none of it, nor do those in Egyptian mummies. I do not agree with Dr. Truman. Dr. Peirce is right in regard to the size of the teeth and the size of the jaws. The human frame is growing smaller, but the teeth are not growing smaller. You nowhere read of the teeth of ancient people being larger than our own, and the same is true with regard to giants,—they are only of normal size.

As civilization advances the jaws grow smaller and irregularities become more frequent. One of the consequences of the decreased size of the bones is the trouble sometimes experienced with the eruption of the third molar. When this tooth erupts early it is easy for it to carry the teeth forward to make room for themselves, but when erupted late it is not so, and sometimes they cause a very great deal of trouble. I remember the case of one of our members, Dr. Darby, who erupted one or two of his third molars quite late. He had a very severe time with it, and suffered for weeks. When these difficulties are met with in these teeth you will find that it is either because of the lateness of their eruption or the crowded condition of the teeth. As to anticipating the difficulty and providing against it, I don't think it is possible to foresee what the jaw will develop

into so early. The better plan will be to wait until the third molars are erupted; then, if there is difficulty, we can extract the second molars. This has been my way. In the case of an impacted wisdom-tooth, we must either remove it or the molar.

Dr. Peirce. The point to be gained by a knowledge of the family history is this: If we know that the family has a scrofulous diathesis, we will understand that there is a tendency to inflammation; and this is true of some other hereditary traits. In such cases the removal of the sixth-year molar will be an operation indicated to save trouble at the time the third molar erupts. A case in point is this,—a young lady presents herself for treatment (several members of whose family exhibited various symptoms of scrofula), in whom the evidences of impaction were conspicuous. Having this knowledge with prognosis almost certain, duty to remove sixth-year molars seemed imperative. Doing so, great suffering was anticipated and aborted. In such cases we could avoid much suffering by acting at once; and if by observation we should find that all cases of great suffering with the eruption of the wisdom-teeth were of this class, we would have an important point.

Dr. J. L. Smith. The point brought out by Prof. Peirce is one of great importance. We ought to know the family history of our patients, and in every case it is our duty to inquire, for the knowledge thus gained ought to enable us better to judge of the course we should follow with them. In many cases, knowing what we might expect from a scrofulous diathesis, or an inflammatory tendency, we would decline to undertake an operation which upon another subject we would undertake with certainty of success.

The impaction of wisdom-teeth may be called anomalous. We find it only in isolated cases, and almost exclusively in the American people. In the Germans it is exceedingly rare; the development of the jaw is better. We can charge it back to our parents; to their dainty cooking and excessive love of comfort and luxuries. If we want to restore the organs to their normal efficiency, we will have to give them more to do—eat coarser food. The slaves in the South had not this trouble, though in many cases their masters did.

In regard to the extraction of the sixth-year molar, no hard-and-fast rule can be laid down; we must study each case and act with deliberation. The result of letting it remain, and possibly causing a necrosis of the jaw from the difficult eruption of a wisdom-tooth, is too grave a danger not to be worth careful thought.

Dr. Fordham. I am in favor of saving the sixth-year molars whenever practicable. The loss of my own has caused me very much discomfort. The extraction of these teeth does not always accomplish the good expected. I know one gentleman, a physician,

whose twelfth-year molars are lying on their sides, in an apparent effort to serve the purposes of both teeth, his sixth-year molars having been extracted in order to gain room for the posterior teeth. In these days, when we can do such marvelous operations, I do not see why we should need to sacrifice these teeth.

Dr. Truman. It does not seem to me that all take the broad view in this discussion. All race types do not have the same over-crowded teeth that the Americans have. In Europe this trouble is rare; and it is very rare among savage people. These teeth occupy their normal position in their jaws. Why is it not so with the American people? It is because as a people we are in a formative or transitional state. We have not reached the true race type. We will reach it in time; it may be centuries, but it is bound to come, and this race will assume a true type form, and the parts of the organism will be proportioned correctly.

Subject passed.

Dr. L. Ashley Faught read a paper entitled

Our Dental Literature,

in which he claimed to have made a careful review of the Dental Cosmos as the leading journal and having the largest circulation, from the year 1872 to 1887 inclusive—a period of seventeen years. For various reasons he had divided this time into two periods of nine and seven years. During the first period—the nine years—he claimed that of the twelve thousand dentists in the United States only three hundred and thirty-four had contributed to its pages, which number includes every one reported as having made an address in a dental society, no matter how brief. Of these contributors twenty-five did more than one-third of the work, and fifteen of them occupied positions as teachers in dental schools. Excluding two copyrighted serials, the number of subjects presented was one hundred and thirteen. The subjects treated may be classified as follows: Theoretical, sixty-eight; relating to materials and drugs, twenty-five; manipulation, fourteen; pathological and therapeutical, six. The topics receiving the most attention were, sixth-year molars, eclectic dentistry, neuralgia, caries, conservatism, "doctor," pulpless teeth, exposed pulps, sensitive dentine, contour fillings, creasote, and amalgam.

Now, as to the second period—that from 1881 to 1887 inclusive. Enumerating as before, and including all who gave voice at a reported dental meeting, we find two hundred and ninety-seven, thirty-two of these having done more than one-third of the work, nine of whom occupied professorial chairs. The number of subjects

presented was one hundred and two. They may be classified as follows: Theoretical, forty-two; relating to materials and drugs, fourteen; manipulation, fourteen; pathological and therapeutical, thirty-two. The subjects receiving the most attention were, crown and bridge-work, dental caries, regulating teeth, filling teeth, pulpless teeth, dental literature and education, amalgam, and prosthesis. The subject which has commanded the greatest attention is crown and bridge-work—which, in the opinion of the essayist, was of less every-day practical value than many of the topics which received but little attention.

In order to show what relation to the whole number of contributors those holding the degree of M.D. bore, a careful count was made which revealed the fact that it was thirty per cent. Dr. Faught admitted that the contributions of those having the double degree were of a superior scientific and literary character, and attributed this to the additional training required for the possession of the second degree. He argued that improvement in the character of dental literature was to be obtained by elevating the standard of attainment required of the matriculate.

Edward C. Kirk, D.D.S., of Philadelphia, Pa., read a paper entitled

Implantation of Human Teeth—Younger's Operation.

The operation of implanting natural teeth in sockets formed artificially in the alveolus by operation is still in the experimental stage, but enough has been done to throw some light on the questions of its expediency, utility, and possible permanence. The operation, as devised and performed by Dr. W. J. Younger, differs in its essential details from the somewhat analogous operations of transplantation and replantation, by virtue of its distinguishing characteristic,—viz., the making of the socket by operation. To what extent the artificial socket is a factor in the production of a successful result cannot as yet be definitely stated. It is believed, however, by those who look upon the operation with favor, that the making of a socket artificially contributes to its success, and possesses a decided advantage over the planting of teeth in natural sockets which are or have been the seat of disease.

Younger's method of performing the operation is to make a linear incision through the gum and soft tissues to the alveolar ridge; then, with a sharp chisel, he carefully dissects the periosteum from the bone on either side of the ridge, the soft tissues forming a flap which, when the tooth is finally inserted, encircles it and helps to hold it in position. The socket is formed in the bone first by means of a graded set of trephines, which are then followed by spirally-cut

burs or reamers, adapted in size to the dimensions of the root to be inserted. The tooth is prepared for introduction by removing the pulp through the apical foramen, which is enlarged sufficiently for the purpose, and filling the pulp-chamber and canal with gutta-percha, and finally at the apex with gold, which is finely and smoothly finished. The tooth is then subjected to the action of a mercuric chloride solution, 1 to 1000, at a temperature of 108° or 110° F., for fifteen or twenty minutes, which completely sterilizes it. The socket is carefully washed out with warm water to remove all débris, and then with pledgets of cotton saturated with the mercuric chloride solution. The tooth is then inserted, and, if necessary, retained by ligatures. Union takes place generally within a few days, and at the expiration of a week the ligatures may be removed. The rapidity and manner of the process of repair varies greatly in different cases, and, so far as a limited clinical experience can determine, seems to be dependent upon two sets of causes: first, the care as to certain details and manner of performing the operation; and, second, the patient's condition of health.

The first factor—viz., the manner of performing the operation—exerts a marked and decided influence upon the healing process, and probably upon the final result. It must be borne in mind that a body foreign to the tissues is introduced,—foreign because devoid of vitality,—and which may become an irritant of sufficient intensity to defeat the object in view, by inducing such a high state of inflammation as may cause suppuration, and if not sloughing, at least failure to unite. Our object is, therefore, to so control the inflammatory process which the irritation of this foreign body has set up that it shall not at any time exceed the degree necessary for repair of the wound and a complete encapsulation of the root. The method pursued by the writer, and which differs in some of its details from that of Dr. Younger, is briefly as follows: An incision is made through the gum with a small "tenotome," and the periosteum reflected from the bone in the same manner as that followed by Younger. The process is then entered and a cut made through the bone the desired depth with a wide and measured spear-pointed drill, mounted in the Bonwill engine having a driving-wheel of the largest diameter. The drill is flat, about three-thirty-seconds of an inch in diameter, and sharpened to a keen edge. Having a speed of 1000 to 30,000 revolutions at command, the drill-cut is made instantly and almost painlessly. The drill-cut is followed by coarse-cut reamers, of which there are two sizes, the larger having five and the smaller having four very sharp cutting-leaflets, winding spirally about the shank. With these instruments the socket is formed. I was led to the use of these coarse-cut instruments by finding that

those with shallower leaflets became clogged and heated while cutting the bone-tissue, needlessly prolonging the operation and greatly increasing the pain. I find that the coarse-cut reamers obviate these objections entirely, and, by running the engine at a high speed, cut very smoothly and with but little jar, on the same principle that the coarse teeth of a circular saw will cut a smooth surface on a board, owing to the immense speed at which it runs. The socket should now be carefully washed, to remove all débris left by the burs, as the smallest spicula of bone or other foreign matter will increase the amount of subsequent irritation and add greatly to the discomfort of the patient by adding to the inflammation of the parts, at the same time retarding the process of repair. The preparation of the tooth is the same as that pursued by Younger, so far as the filling of the root is concerned. The sterilization is effected in a special apparatus devised for the purpose. It consists of a rectangular copper box, nickel-plated, with a hinged lid perforated with three holes for the reception of three glass vessels, in one of which is mercuric chloride solution, 1 to 1000, in which the tooth is placed for about twenty minutes before it is inserted ; in another, distilled water; and in the third a somewhat stronger solution of mercuric chloride (about 1 part to 500 of water) may be placed for dipping the instruments.

In entering the tissues of the ridge when forming the socket, great care must be taken to leave sufficient thickness of gum-tissue on the labial or buccal aspect of the socket, and to avoid puncturing it at this point. If only a very thin tissue covering is left for the root on its buccal or labial aspect, the distension of the tissue on that of the socket, caused by the introduction of the root, strangulates the circulation of the part, and results in partial or complete absorption of that portion of the socket-wall; or, should the outer wall of the socket be accidentally punctured, failure to unite at that point will most surely follow, leaving a denuded patch of the root exposed to view, which not only presents an unsightly appearance, but to a considerable extent endangers the permanence of the result.

My first case of implantation was performed November 30, 1886. The patient, a lady about thirty years of age, had lost the first superior right bicuspid ten years before. A suitable tooth was treated and implanted after the manner of Younger. Union took place by first intention, and at the expiration of three weeks the tooth was in no way distinguishable from the normal teeth. A noticeable feature of this case, and one which has occurred in a majority of the cases of the writer, is that on the third or fourth day after the operation a considerable exudation of plasma took place under the gum-

margin in the tissues around the neck of the implanted tooth, forming a distinct ring, and giving a thickened appearance to the gum-margin. This thickened ring, which during the first week or ten days was quite soft to the touch, gradually became harder, until finally it became rigid and unyielding, and presented to the touch all the physical characteristics of a bony callus. Upon percussing the tooth with a steel instrument a peculiar and distinct resonance, totally different from the rest of the other teeth, was evolved. The impression produced was that of a bony anchylosis or direct union with the ridge without any intervening membrane. That such was the case is further indicated by the fact that the tooth is perfectly devoid of that slight mobility common to normal teeth. The condition just described has, with two exceptions, been typical of thirty-three teeth implanted by the writer up to the present time, and, so far as a close clinical observation of each case can determine, seems to be the normal process of repair of the tissues in cases of implantation.

When we consider the process by which a wound of the tissues involved in the operation of implantation is repaired under normal conditions, and in which we do not have to deal with the tooth as a factor, the rationale of the method is easily understood. Immediately following the incision, an exudation of leucocytes or so-called plasma-cells takes place. These in a short time after become organized, and develop into connective tissue with its capillary blood-vessel system, following which in bone a deposit of calcific material takes place, and ossification ensues through the agency of the osteoblastic cells which belong to the connective-tissue group.

Under favorable conditions—that is, where from any cause the irritation is sufficiently great to set up and maintain for a time a high state of inflammation—giant cells or osteoclasts are developed, and absorption takes place until the cause of the irritation is completely removed. It is also possible for the inflammatory process to abate and a normal condition of the tissues ensue, whereby the reparative process first alluded to will result, even after a considerable degree of absorption has taken place.

In view of the foregoing considerations, it is therefore of the greatest importance that in all cases of implantation the inflammation caused by the operation and to a certain degree maintained by the presence of the tooth, which acts or may act as an irritant, should be kept within the narrowest possible limits, to insure the very best results in each case. The means for accomplishing this may be briefly summed up as follows: First, the careful selection of a tooth nicely adapted to the case, and having its pericemental membrane intact; its proper preparation by removing the pulp and

filling the chamber and canal. This may be accomplished by an entrance effected through the apical foramen or through the palatal surface; but if by the former special care must be exercised in finishing the final gold cap smoothly, so that it shall be absolutely free from roughness or projecting points which might cause irritation, and next its absolute sterilization in the mercuric chloride solution, as before described; secondly, the formation of the socket with sterilized instruments as carefully and as rapidly as is consistent with thoroughness; complete removal of every particle of débris; sterilization of the socket and tissues surrounding it by means of mercuric chloride solution, and maintenance of aseptic conditions about the implanted tooth and throughout the oral cavity by means of phénol sodique or its equivalent, until repair has been completed. The last fifteen operations which I have performed have been done under the influence of cocaïne as a local anesthetic. The action of the drug in these cases has been so satisfactory that in no instance where it has been given time to act has any pain whatever been felt. The method which I pursue is to inject into the gum-tissue in a line with the proposed socket from a minim to a minim and a half of a fifty per cent. solution of cocaïne hydrochlorate. The full anesthetic effect is reached in about ten minutes, when the tissues can be cut and the socket formed entirely and without pain. The reason for using so strong a solution is that it requires about a quarter of a grain of salt to produce a sufficiently profound effect. The tissues being rigid and unyielding, it is difficult to inject a larger quantity of solution, which would be required if a dilute solution were used.

I have had no unpleasant results, either local or general, from the use of the drug in this manner, nor does it seem to have any effect whatever upon the process of repair. It renders the operation absolutely devoid of pain, the only disagreeable feature to the patient being the slight painful sensation produced by the introduction of the hypodermic needle. This, however, is but momentary. Whether this operation will become one of the recognized procedures in operative dentistry or not will depend upon the measure of success obtained, and just what constitutes a successful operation of this sort is an open question. That failures do occur from the absorption of the roots of planted teeth we are all aware. Loss of the tooth due to absorption may occur at variable periods of time, ranging from a few months to several years, but the same thing—that is, absorption of the roots—occurs in normal teeth, and is due frequently to causes which we are unable at present to fathom. Compared with many of the other operations which we perform for the conservation of the natural teeth, the record would seem to afford a comparison favorable to implantation.

I have, out of the thirty-three operations which I have done, lost three teeth, two of which were in the same mouth,—that of a young man suffering from the dyscrasia of syphilis. This case I reported in the DENTAL COSMOS for December, 1887. The other case in which the tooth was lost was that of an apparently healthy young man of fine physical appearance, for whom I implanted a left superior cuspid in October last. He reported to me last week that while biting a hard crust of bread he felt the tooth suddenly break loose, with a noise which he described as like a pistol-shot. An examination of the tooth, which he brought to me, showed that it had been largely attacked by osteoclasts, which had formed deep, bay-like excavations in the cementum, weakening the tooth to such an extent that it had sustained a transverse fracture at about the middle point of its length, from the force incident to masticating a rather hard bread-crust. It is perhaps worthy of note that in both instances when the teeth were lost absorption had taken place in about six months.

What will be the final status of Younger's operation is a question that can only be decided by the crucial tests of time and experience. All innovations have throughout the world's history been met by opposition and adverse criticism, which have served either the purpose of stimulating their champions to greater endeavor or resulted in their defeat, and Dr. Younger's operation has not been an exception. It is still in the probationary stage, but at the same time giving much promise of occupying a high place in the catalogue of future dental operations. It has been called "unsurgical" because it is unique, but the highest ideal of surgery is or should be conservative, and it reaches its fullest expression when we save an injured member or restore a lost one. The amputation of a limb and the extraction of a tooth are practical confessions of surgical defeat. It has been fully demonstrated by Younger and those who have followed him that, without regard to any accepted theory of the past, teeth may be planted after his method and become firmly united to the alveolus by some means sufficiently strong to perfectly fulfill the requirements of normal teeth, at least for a time.

The discovery that Dr. Younger has made and had the courage to promulgate should entitle him to the honor and thanks of every man in the dental profession who has the advancement of his calling at heart, for he has done all that any man can do up to date in the matter of demonstrating by his operations in this line what was heretofore unknown, and even believed to be impossible. That it should prove to be a final success is desired by everyone, as no method of restoring a broken dental arch to usefulness and symmetry by artificial substitution bears favorable comparison with it; and if time should show that implanted teeth could be retained but

two or three years as a maximum limit, I should not hesitate to recommend and practice it, after the satisfactory experience I have had in its performance, as by the methods which I have detailed it is nearly painless,—the ordinary operations of filling far exceeding it in this respect,—and I believe it to be free from danger.

The following extract from a note from Dr. H. C. Herring, of Concord, N. C., for whom I implanted a superior lateral incisor, so well represents the case from the stand-point of the patient that I take the liberty of reading it: "There was the slightest pain during the operation; no subsequent soreness until the afternoon of the 20th. It was nothing similar to periodontitis, but a soreness analogous to an insect-bite, without any swelling or visible inflammation. It had entirely subsided by morning. The eighth day I removed the ligatures, as they were causing trouble to the gums of the adjoining teeth. Since then it has caused neither annoyance nor trouble. Upon the other hand, it has always felt perfectly comfortable. It is now as firm as others, and, while I do not subject it to any hard usage, yet I am sure it can do the work of others. It has turned about two shades darker; it is still about one shade too light. Now, comparing it to a partial plate, I do not regard the operation as the lesser of two evils, but a real boon, a godsend; and he who will throw away his partial piece, or tear out an anterior bridge, and avail himself of this surgical enigma, will rise up and call it blessed. I am so delighted, if needs be I would willingly submit to the operation every six months."

Discussion.

Dr. Gerhart. I would like to ask Dr. Kirk how long these teeth had been out of the mouth, and what measures, if any, had been taken to preserve them.

Dr. Kirk. All had been out of the mouth at least three months. In one case reported to me by Dr. Herring the tooth used by him had been out of the mouth for at least seventeen years, perhaps longer. No effort is made to preserve them alive; they are in each case kept dry until I begin to make my preparations for implanting them.

Dr. Gerhart. The reason I asked was because I had made successful transplantation in one case with a tooth which had been extracted three months. I desired to know whether the tooth was apparently dead or if there was possibly an appearance of life in the pericementum. I am almost certain that there was vital union in one case after four months, and the question is, Is there a possibility of revivification of this tissue after a very long time?

Dr. Sudduth. This is a very interesting question. Although I have not had any experience in the operation, I will present a theory of what takes place. In healing, nature's first effort is in the form of plasma-cells or coagulum; all tissue is formed in this way. The white blood-corpuscles change first into plasma-cells, then from the cell into new tissue. Then the exudation breaks down, or it organizes, and the whole secret of success is to keep the inflammation down until a union is made. If this is done, the tooth will be encapsuled. Then the cementum is full of canaliculi, and the coagulum will pass into them, and so, if the tooth is not living, it may contain living matter and really have vital union. There is also another union. It is the union by first intention of bone, or the formation of new bone, which by adaptation to the root will hold the implanted tooth in place by the firm union of bony anchylosis. I think if you follow out the process as detailed by Dr. Kirk of having everything sterilized, so as to have a healthy wound and keep everything clean, you will, in the best cases, have permanent results.

Dr. Gerhart. So far as Dr. Sudduth has answered my question he says the union is merely adaptation, but I think it is more, or, at least, in the case I will describe it was: A young man had lost a tooth by the kick of a horse. I replaced it at once by one which had been lying around my office for some months; it was too small for the socket, and a trifle longer than its neighbor. I inserted it and ligatured it, to steady it. In the process of healing it was drawn up in the socket so as to be one-sixteenth of an inch shorter than its neighbor. This makes me think that there must have been vital union established.

Dr. Sudduth. I would ask if the tooth had an opponent?

Dr. Gerhart. Yes.

Dr. Sudduth. Then it is easily enough explained. The tooth was crowded further into the socket by its opponent. Besides this, all healing is by cicatricial tissue, and this always shortens. About the revivification of tissue, I had some experience in the way of transplantation of tissue in the case of skin-grafts, and it was demonstrated that the grafts, kept carefully moist and treated antiseptically, could be grafted with a fair prospect of success thirty-six hours after they were removed from the living body, and not longer. For anyone to suppose that the pericementum of a tooth could have anything of life in it after it had all dried up and been dead for years, is too ridiculous to discuss.

Dr. Faught. The assertion has been made that there is no danger of infection or of disease being caused by implantation. I think that we cannot be quite sure that there may not be danger. Those of us who remember Prof. Barker's experience in transplantation will feel a little hesitation about this new process.

Dr. C. V. Kratzer. I would like to ask Dr. Kirk if he pays any attention to the condition of the tooth, and if it is necessary to have the pericementum intact?

Dr. Kirk. I have made every effort to select suitable teeth. They should have the pericementum intact. I always take the greatest pains in selecting a tooth for each case, and it is often difficult to find what one wants. I am glad Dr. Faught called attention to the question of infection. I want to ask, is there any evidence of such harm having been done by this operation? I fully believe that the danger of infection is eliminated by the perfect sterilization it is subjected to. Those who have not seen the operation are the ones who criticise it most. I would like to know more about the circumstances of the case of Dr. Barker referred to. I understand that he replanted some teeth for a lady who died in consequence.

Dr. Smith. This is a fruitful subject for discussion. I have been fearful of replanting, transplanting, or implanting. I believe we should be exceedingly cautious about what we do in the living tissues.

Dr. Truman. The case of Dr. Barker was not at all analogous to the operations described by Dr. Kirk. He removed four or five teeth for a patient, and afterwards replaced them. The last tooth replaced caused the death of the lady. Dr. Barker used no antiseptic precaution; he did not smooth off the end of the root, nor did he fill the foramen; the consequence was that irritation was set up, and tetanus ensued. The operation of implantation is as far removed from this as night is from day. The only danger I can see in this operation is that the antrum might be entered, and this would be likely to give rise to trouble. I agree with Dr. Sudduth's theory about how the implanted tooth is retained, and think that it is possible that a porcelain tooth would answer as well, in which case there could be no danger of any infection.

Dr. Guilford. One or two things about this operation have not been brought out. When we first heard of it most of us thought, "There is another fool," and when Dr. Younger came East it was with difficulty that he could get an opportunity to operate; but now we are all of us willing to see it tested, and many of us think it may become a permanent operation. In a living tooth we have a membrane surrounding the root, and this membrane is attached to the soft tissues of the jaw. It is not attached to the bone, but to the soft tissues of the alveolus. It has been proved beyond question that union does take place in the case of an implanted tooth, but different from the normal union; yet it seems to depend upon the pericementum surrounding the dead tooth. Now, what part has this dead pericementum to play? Younger thought it was revivi-

fied, but could not tell how. Dr. Kirk has given the best hypothesis. It is that, while the pericementum cannot be revivified, it can act as a sponge does in sponge-grafting,—as a leader which conducts the fibrillæ of living matter from the surrounding parts to the tooth, which, being porous, admits those fibrillæ into the substance of the root, and thus an attachment is formed. This, of course, could not take place in a porcelain tooth.

Dr. Kingsbury. I was pretty thoroughly cognizant of the facts in Dr. Barker's case, having heard his statement to the Philadelphia College. There was no similarity between that case and those of Dr. Kirk. The lady had had five or six teeth extracted for neuralgia, and the doctor excised the points and re-inserted the teeth. He did not round off, nor smooth, nor finish the ends of these roots, nor did he fill the foramen, and I have no doubt the rough ends caused the tetanus which resulted so disastrously.

This operation of implantation is very different in its principles from transplantation—the insertion of a tooth into the socket from which one has recently been extracted; or replantation—the re-insertion of a tooth into the place from which it had been extracted. These two operations have been well known for a hundred years or more, and many of us have performed replantation in cases where a tooth has been accidentally extracted. This is a safe operation, and will almost always give good results. The operation of transplantation is liable to result disastrously by carrying seeds of disease.

I have examined several cases of Dr. Kirk's, and look upon the results as very remarkable. I do not see, though, why we should not be as successful without the pericementum as with it.

Dr. Kirk. I think not. The failures I have seen were in cases where the teeth were denuded of the pericemental membrane. I do not know what the exact function of this dried membrane is. I don't believe it is revivified, but think that it swells up and the tissues receive it more kindly than they would the hard tooth-substance, thus making the foreign tooth less of an irritant.

Dr. Litch. Having witnessed Dr. Kirk's operation, my mind is disabused of the idea which I had that it was a very barbarous one, but still I think it is very dangerous. It is liable, like transplantation, to the danger of conveying the seeds of specific disease. Nor can I be certain of the permanence of the tooth thus implanted. The operation, it would seem, must be confined to the incisors of the upper set, and there is danger of penetrating the antrum, which would give rise to trouble. If performed on the lower jaw there would be great danger of going into the nerve-vessel, which might cause tetanus.

On Thursday morning, June 7, Dr. W. E. Magill, of Erie, Pa., read a paper entitled

Dental Irregularities and Their Correction.

I have been asked to say something by way of opening what may prove a useful discussion of an old and somewhat threadbare topic, but which holds so important a place in practice, and claims so much interest from members of our profession, that it may with propriety often be called up for consideration, if only to inquire what progress has been made, or what experience may tell of plans of procedure which have been on trial.

When irregular teeth are presented for examination and advice, the first question to decide is whether you had not better let them alone. This is the question of questions, upon the wise decision of which may depend your reputation, your comfort for a considerable period, and not only your comfort, but various important results to your patient. No hasty conclusion should be adopted. Nature can do wonders, and may be competent, if given time, to right all that seems wrong. The best motives and kindest intentions sometimes urge us to an interference with nature. Professional pride comes in and remarks, "You had better take the case now or Dr. Lever will get it." The desire to experiment on a new case, or to try a new appliance, is always strong enough to be difficult to resist. However these influences move you, make up your mind once for all, at the outset, that no *fee*, present or prospective, shall induce you to undertake a case against the dictates of your deliberate judgment.

To one who feels able to cope with mechanical difficulties this department of practice is fascinating, and the greater the difficulties presented the more absorbing becomes the interest of the operator. To bring order out of chaos; to introduce symmetry where distortion has prevailed; to establish beauty in the place of ugliness, is no mean ambition.

When satisfied that no interference is needed, you should make as plain as possible to the patient the reasons for your decision. This is very important when you advise delay, for a little dissatisfaction with your course, coupled with an impatient desire to be good-looking, may send your patient to Dr. Forceps, who is always ready to advise and take the short cut of extraction, because it brings the certainty of cash in hand. He knows, too, that as "dead men tell no tales," so teeth extracted take away testimony as to conditions that prevailed.

When you have decided that interference is necessary, you have only reached the foot of the "hill of difficulty." The full responsibility of a careful diagnosis is upon you, and "to pull or not to pull"

is often an important question not easily decided. Irregularity usually presupposes want of room, and continued want of room is a barrier to success in any attempt to regulate. My own experience is, that at this critical time we are likely to fail for want of a thorough examination and consideration of each case in all its bearings. We may undertake to spread an arch when better articulation could be more easily secured by extraction, and all other benefits as surely gained or retained as they could be by long and laborious, perhaps painful, interference.

It is possible for us to start out with an exaggerated estimate of the value of the individual natural tooth. This is all right when viewed from the side of conservative dentistry, or when a comparison is drawn between the natural organ and an artificial substitute, but is out of place when it interferes with a proper procedure to secure "the greatest good to the greatest number." As in civilized society the interests of the individual give way when they contravene the public good, so the value of a single tooth is more than counterbalanced by the importance which attaches to the other members of the arch.

We are under obligations to take the best, the most direct, and least painful plan. If that involves the extraction of a tooth, we should have no hesitation about its removal. The attempt to force teeth into position when room has not been provided risks failure, or protracted effort, pain to the patient, and the devitalization of teeth by severe and prolonged disturbance. Sometimes, too, this mistaken economy results in successful enlargement of the arch, but precludes proper antagonism with the opposing arch and carries it outside the line of beauty for the mouth. Then there is the ever-present tendency to revert, always more powerful when abundant room has not been secured, the necessity of wearing a retaining device for a long time, and sometimes the annoying experience of finding the teeth ultimately in their old position.

In this early diagnosis the condition of the alveolar arch is a very important consideration. If it is in good form and width as compared with the opposing arch, and if, in the main, articulation is good, the irregularity consisting in the deviation of a few teeth from their proper position, the probability is that judicious extraction is the short and direct road to success. Not necessarily the removal of all that are out of line—perhaps not any of those that are irregular. Sometimes irregularity of the bicuspids, or even of the cuspids, may be satisfactorily remedied by the removal of a defective molar. This plan may require the additional use of appliances, but be justified by the exchange of a diseased tooth for one that is sound. It has become settled, and I think wise, practice to preserve the cus-

pids as more important, and extract one of the bicuspids, in the common cases where, all the teeth being sound, the cuspids have developed outside the arch. Some operators, however, do not hesitate to extract the cuspids, and may have reasons for such practice. If this is done as the result of ignorance, such ignorance is culpable; the practice is certainly in violation of good taste.

The literature of our profession proves that experience has given us established rules of practice, some of which have crystallized into principles of general application. I refer with pleasure to the work of Dr. Kingsley, entitled "Oral Deformities," and to the more recent publication, "The American System of Dentistry," under the head of "Orthodontia."

It is generally conceded to be good practice to postpone serious and extensive interference until the complete development of the permanent set. I think we may adopt the rule that no considerable force should be applied to a *partly developed* tooth to drive it into proper position. In the case of upper teeth developing inside the lower arch, I would fit a plate with biting-blocks, to give room, and rely upon mere guidance or impingement upon the palatal surface of the coming tooth, leaving to nature the application of force.

Wise prevention is quite within our province. When a well-formed arch is crowded, and there is an apparent certainty that slight irregularity already existing will be increased or aggravated by the development of third molars, there comes a time for the exercise of judgment in the selection of teeth to be removed before the expected trouble shall arrive.

I have been much interested in irregularity caused by disease of the investing membrane, which usually consists in a movement to right or left in cases involving front teeth, but the movement of molars is usually in the line of pressure from occlusion. Incisors sometimes elongate; sometimes the side movement continues to the extent of overlapping a neighboring tooth. In such cases mechanical appliances may be used as aids. The true corrective is treatment of disease in the tooth-socket.

When we have decided to move teeth we have determined to push, to pull, or to rotate, and by the use of the mechanical powers—the screw, the wedge, or the lever. Either is sufficient if we can use it. Judgment is to be shown in the selection, and skill in the successful application, of mechanism. I have but little to say of appliances, because our professional museum is so well stocked that American ingenuity would deserve high rank if judged alone by the devices to regulate teeth.

It has been reported of Archimedes that he said he could, with his lever, move the world if only a sufficient *fulcrum* could be fur-

nished. The dentist, too, has serious thoughts about a fulcrum when he is trying to move a bicuspid towards a molar, and finds the molar rapidly approaching the bicuspid, while the latter remains *in situ.* For such cases I think we still need a pulley-and-tackle combination, or a device which shall give the short arm of a lever to the bicuspid and the long arm to the molar.

I am in favor of intermittent force for moving teeth, and for the following reasons:

1st. It involves less pain to the patient, or, what is equivalent, gives periods of rest and relief from soreness.

2d. It is the safe plan. It is but seldom we can move a tooth without some irritation of the investing membrane. If we limit movement we may limit irritation, and therefore have less anxiety about a case when the patient is beyond our reach.

3d. It gives time for natural processes of repair. It is of no value to move a tooth so rapidly that an open fissure shall develop in its wake. Therefore, for power preference would be given to the screw or wedge, or combination of screw and wedge, or screw and lever, for ease of control and convenience.

While ingenious appliances are helpful in practice, the same results are sometimes attained by means more direct and less complicated; and in this department of practice the pressing demand is not so much for more machinery as for judgment, wisdom, and deliberation.

Discussion.

Dr. Guilford. I only desire to make one or two points in regard to the subject of this paper. In regard to extraction for the sake of correcting irregularities, we should be very careful. It requires our best judgment sometimes to decide whether it would be better to extract or to wait and see if nature would not make the room needed. In the case, however, of a patient whose upper teeth close inside of the lower ones, the earlier the matter is attended to the better. In other cases, if the patient is young it is usually better to wait, as the arch enlarges very considerably between the ages of twelve and twenty years.

Sometimes it is difficult, when an operation is necessary, to determine whether it is better to extract to make room, or to expand the arch and thus make room. It is also important to remember the inherent corrective force of nature. A tooth will sometimes put itself in place if it has a chance. This is especially true in regard to the cuspid. It will move into its place if the tooth in its way is removed. I had a case of a girl about twelve or thirteen years of age where the cuspid erupted quite outside of the arch. The bicuspid was between it and its proper place. I applied ligatures

with the view of moving it away from the bicuspid, so as to get room for extraction of the bicuspid. The pain from the ligatures was so great that the father of the child cut them off, and I did not see her for two years afterwards, when I found that the cuspid had assumed its proper position by the mere force of nature.

Dr. Kingsbury. The dentist, when guiding the dentition of children, should be very careful not to make the mistake of unnecessary extraction or too hasty interference of any kind. The enlargement of both jaws between the ages of ten and fifteen years is something which we must remember, for it will often give the over-crowded teeth plenty of room to arrange themselves. It is a grave mistake to extract a cuspid. If the first bicuspid is extracted the cuspid will take its place in line. Often it is better to extract the second bicuspid, then the first bicuspid will move back and make room for the cuspid.

Adjourned.

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

The regular meeting of the Odontological Society of Pennsylvania was held at the northwest corner of Thirteenth and Arch streets, Philadelphia, Saturday evening, June 2, 1888.

Dr. L. Ashley Faught called to the chair.

S. B. Luckie, D.D.S., Chester, Pa., read a paper entitled

Utility of Pulp Preservation.

In the conservative treatment of the dental pulp there appears to be a diversity of methods employed, and nearly every one who has written anything upon the subject, after outlining his manner of treatment and extolling the virtue of the material used as a cap, claims many successes and reports but few failures.

The suspicion is frequently aroused that possibly the record is searched for cases that have resulted in successes, and a minority only of the failures reported. A medical writer says, "It is well that all available cases should be reported, no matter how they terminate, and whether or not they reflect credit on the medical attendant, for it is apparent to all who read that the great mass of reported histories of all kinds and degrees are those in which the doctor is covered with glory, and the patients all get well; while much more valuable lessons might evolve from honest confessions of our failures, had we the courage to present them, and thus bring out the criticisms and opinions of our confreres." If we, as members of the dental profession, should take this advice, record our cases properly, make notes regarding them, and examine with critical care, ascertaining to a certainty as to the results, being will-

ing to discuss both successes and failures with one another, valuable lessons might be our reward.

It appears to me that the limited possibility of preserving the pulp for a lengthy period of time is a fact that should be gravely considered before we attempt a line of treatment looking to its preservation. From some peculiarity of the organ it is a difficult one to restore to health, and though we may to all appearance obtain comfort and quiet for a time, the probabilities are that its function has been interfered with permanently by a disturbance of its vascular and nervous supply. In many cases a low form of inflammation continues after treatment, and the organ degenerates and finally dies, sometimes without producing any pain, the tooth remaining comfortable long after it has become pulpless. In other cases the function is accelerated and secondary deposits are produced. For some time in the history of pulp-treatment this was the object desired, because such a deposit would be a natural protection, and if produced would preserve the organ in a normal condition. But clinical history demonstrates that such functional activity when once excited continues. The irregular formation is a pathological result ending in exhaustion and death of the pulp. If when the case presents itself we could control the inflammation, no matter what the grade, and bring about a permanently normal condition, no argument would be necessary to establish the superiority of the preservative over the destructive method; but until this can be done we must be controlled by circumstances and consider that method the most conservative which promises the longest period of usefulness and comfort.

The questions prior to treatment are, What is the value of the pulp to the tooth? What is its pathological condition? Is the general health of the patient such as to give the organ sufficient nourishment should we properly protect it from external irritation?

As the dental pulp is the remains of the dental papilla, and is the organ that makes the dentine, its value is greatest before the eruption of the tooth, diminishing as formation goes on and becoming practically ended when the tooth is fully formed and capable of being retained by its periosteal attachment. If within the time between the eruption and the complete formation of the tooth an exposure should occur by accident or disease, the concern for the life of the pulp lessens as the time of exposure approximates the period when the tooth can be independent of the pulp.

According to recent histological investigations, the dentine alone is dependent upon the pulp. Dr. Sudduth has demonstrated the fact that the enamel is simply a coat of mail placed around the dentine to protect from external violence, and subserve the purpose

of mastication, and that its hardness is due to desiccation, the enamel to a considerable extent possessing the property of a crystallized product. This being accepted, there need be no concern as to the effect upon the enamel if the pulp should be sacrificed. The question arises here, Is not the attachment of the enamel around the dentine weakened after the death of the pulp? Upon this point I am not prepared to give a positive opinion, but am inclined to believe that cleavage between two products is more likely to occur.

I know of no literature upon this subject, and hope that investigations will be pursued until we obtain definite information. Experience, however, shows that the splitting of the enamel from the dentine occurs most frequently after the loss of the pulp or when the dentine has attained its most calcified, and the enamel its most crystallized, condition. If the exposure occurs soon after the eruption of the tooth, a more serious condition is presented. The development of the dentine in the root portion being incomplete, there is a large apical foramen, which precludes successful root-treatment. In this condition the most urgent demand is for a method of treatment that will preserve the pulp so that it may complete its special work. If at this period an exposure should occur, consideration should be given to the stage of inflammation that is presented, and as it approximates to suppuration there will be less and less hope for the salvation of the organ; yet cases have been reported in which parts of the pulp had been lost and the remaining portion continued in a normal condition. Though at this critical period hope may be faint, an effort should be made to preserve the organ until the complete maturity of the dentine.

When the pulp has completed its constructive work, and the tooth is free from caries, abrasion, erosion, or local irritation, with no excess of pabulum in its blood supply, it remains practically at rest. Should, however, the nutritive process be continued until the tubuli are filled to obliteration with calcic material, there will ensue a condition more difficult of treatment than that known as "soft teeth." Tooth-substance is subject at all times to the destructive processes of caries, abrasion, and erosion, and these lesions even in their early stages have a stimulating effect upon the pulp, while the general economy is not so perfectly balanced as to supply exactly the necessary amount of nutriment to the organ. In an exposure occuring after maturity, in view of the uncertainty of preservative treatment, of the small value of the organ, and of the achievements in antiseptic treatment of root-canals, destruction of the pulp may be regarded as most expedient.

In conclusion, the value of the pulp and the importance of pre-

serving it is greatest in the very young tooth with incompletely developed dentine. In more mature but still incomplete development extirpation can be looked upon more favorably, but preservation of the pulp may be attempted when there are no forbidding inflammatory conditions. When the pulp has completed its formative work, its extirpation may prevent induration of dentine such as will cause the tooth to become a foreign body.

Discussion.

Dr. Guilford. I am very much pleased with the paper just read by Dr. Luckie. It is short, concise, and practical. The relative importance of the pulp to the tooth is not always fully appreciated. Dr. Luckie takes the ground that the pulp may not be of any value to the tooth after it is once formed, because the tooth will still be nourished by the pericementum. This is only true to a very slight degree, if at all. Recent histological investigation has shown that the nutrient vessels of the pericementum, while freely entering the cementum, scarcely ever cross the line and enter the dentine. The pulp is the formative organ of the dentine, and after its function of formation has ceased, or rather been suspended, it continues as the nutrient organ of that tissue. The pericementum is in the same manner the formative organ of the cementum, and afterwards becomes its source of nutrition. Therefore, to destroy the pulp is to remove the source of vital support of the dentine. This is a very serious matter. True, the pulp may be devitalized and the tooth remain in place and do good service in mastication for many years, but it is no longer a whole tooth. It is a cripple, just as a man is who has lost an arm or a leg or both.

Another reason why all care should be exercised to preserve the vitality of the pulp lies in the fact mentioned by the essayist, namely, that the attachment between the enamel and dentine is much greater in a living tooth than in one that is pulpless. This is true, as probably all of us know from experience. Many years ago, when we were in the habit of restoring badly-broken teeth by building up with gold, I had an unfortunate experience in this line. I was restoring all of the crown of a bicuspid, except a portion of its buccal cusp. The enamel was greater in extent than the dentine, and when the operation was nearly completed I found that the entire enamel had scaled off from the dentine in one piece just as layers of slate separate. This could not have taken place in a living tooth, for the attachment between the two would have been too strong. Microscopists fail to find any reason for this attachment in one case and the lack of it in the other, but most of us know it to be true from practical experience. There are other

reasons for preserving the vitality of the pulp, but we have no time for discussing them this evening.

Dr. Sudduth. As a rule I never advocate efforts to improve on nature, and should hesitate to destroy a pulp in order to render the operation of filling easier, yet if it became necessary to devitalize a pulp for prosthetic purposes, as for instance to anchor a piece of "bridge-work," I should not hesitate. The main office of the pulp is formative, and all the "live" portion of the dentine is a part of the pulp; the dentinal fibrils are prolongations of the pulp, and when the latter is destroyed they die also. There is no other tissue in the dentine to nourish, hence no need of nourishment after the death of the pulp. The function of a tooth is to serve the purpose of mastication, and as after it is fully developed it will be retained in its place by the pericementum and will serve the office of mastication quite as well as when its pulp was alive, provided the root-canal has been properly filled, therefore I see no harm in devitalizing the pulp if necessary. The term "coat of mail," which I have applied to the enamel, refers to its formation. That it is complex in its construction no one doubts; it is, however, a secretion, and has not the "vital" constituents or attachments to the dentine. The basis-substance of the dentine and enamel are continuous, but there is no vital connection between them, using the word "vital" to represent those tissues that have the power of reproduction. The enamel is "laid down" upon the dentine, and the attachment is one of adaptation. The easy separation of the one from the other after desiccation bears me out in the above assertion.

Dr. Guilford. I would like to know why it is so easy to separate the enamel from the dentine in a dead tooth,—I mean one which has been extracted for some time. In studying such teeth and in preparing them for study, I have often found that the enamel could be split off from the dentine with the point of an excavator.

Dr. Sudduth. I have never seen such cases, but if such occur, would say that it is because the two are separated by desiccation. The dentine contains considerable organic material which by drying shrinks and alters its form, while the enamel, impervious to moisture and unchanged in shape, retains its form and its dimensions, and so is loosened.

Dr. Guilford. In the case of teeth in the mouth this difference is apparent. In preparing a devitalized tooth—one that has been dead for a long time—it is liable to be denuded of its enamel unless great care is exercised, while in a living tooth there is no such danger.

Dr. Sudduth. The point I would make is this: The conditions are changed in regard to the contour of the tooth when it is devitalized. The form is changed by desiccation, and the difference in the

consistence of the dentine and the enamel causes a variation and destroys the attachment between them.

Dr. James Truman. This subject is too large for us to do justice to in the time we have at our disposal. We probably all agree in the opinion that we ought to save the pulp if possible; but I do not regard devitalization as lessening the usefulness of the tooth to any great extent. I agree with Dr. Sudduth that there is no vital connection between the enamel and the dentine; yet in giving this opinion I am aware that there is much to sustain a contrary view. I cannot apprehend how the death of a pulp can cause the scaling of enamel. Previous to the adoption of capping all pulps were necessarily destroyed and the roots filled; but I have no recollection of any such disastrous result following the operation.

The question that requires solution is, What is to be done with exposed pulps? The great variety of opinions, more or less positive, has unsettled practice to such an extent that it is very desirable that a closer study should be given it. It is not possible for one person to do this: it must be the work of many, and that after a careful compilation of statistics kept by equally careful operators. Through the kindness of Dr. Louis Jack, I have had recently the pleasure of examining a number of his cases. These covered a varying period of time since the capping was introduced, the longest I think eighteen years. Dr. Jack keeps very careful records, and tests the teeth at different periods as to vitality. This test is made by enveloping the tooth in rubber-dam and injecting ice-water upon it. The response, with two or three exceptions, was immediate and most satisfactory as to the vitality of the pulp. The exceptions gave no indication of death having occurred. While nearly all of these were filled upon the system at present practiced by Dr. Jack, it was not the case with all; some of the earlier were capped with a pellicle of gutta-percha, and gold plate. For Dr. Jack's method see "System of Dentistry," vol. ii. pp. 149–168. The mode is in brief to take a cap of platinum "filled with a paste composed of oxide of zinc and equal parts of carbolic acid and oil of cloves." This is then covered with a temporary filling. The success of this mode in the cases examined was beyond question, but all these were above the average in point of density, and the question naturally arose, Would it be possible to secure the same results with a poorer quality of tooth-structure? The general experience is against such a conclusion. The very dense teeth, showing marked vitality in the individual, are not the most difficult to preserve in full vitality; indeed, I have found these the most troublesome to destroy with arsenic, at times absolutely resisting its action. The difficulty of knowing exactly what to do—what is best to do—is very great.

Where is the line to be drawn beyond which it is unsafe to go? or is there any line at all? For myself I am not able to arrive at definite conclusions, but this much seems certain: that systemic conditions and the character of the teeth must be closely observed before arriving at any decision, and after all the chances are very much against all teeth below an average density.

Dr. Faught. Dr. Luckie says that when the pulp is destroyed there is nothing left but the attachment to the alveolus. This is not true; the attachment is not to the alveolus but to the process. Such verbal error is not of much consequence, but it is better to be correct.

Dr. Tees. I place great value upon the pulps of teeth, and always endeavor to save them. Before treatment, the violent pain from an irritable pulp can be quickly relieved by sealing in the cavity, by means of oxychloride of zinc, a pledget of cotton moistened with carbolic acid. A devitalized tooth is much weaker than a vital one, and more care should be exercised in handling the instruments during the preparation of a cavity and the insertion of a filling, because the enamel is very apt to crumble or to chip off.

Dr. Bonwill. It is seldom that I have a pulp exposed, in cases that are under my care, either from want of attention or from carelessly handling the instruments. The bulk of cases where I treat the pulp are from the hands of other dentists. I remove the pulp immediately, and in ninety per cent. of such cases I think the teeth can be saved. I have not been successful in capping, nor have I found successes coming to me from other practitioners.

AMBLER TEES, D.D.S.,
Recording Secretary.

MISSOURI STATE DENTAL ASSOCIATION.

THE Missouri State Dental Association held its annual meeting at Pertle Springs (Warrensburg), Mo., commencing on Tuesday, July 10, 1888.

The following officers were elected for the ensuing year: B. Q. Stevens, president; T. W. Reed, first vice-president; W. E. Tucker, second vice president; John G. Harper, recording secretary; William Conrad, corresponding secretary; James A. Price, treasurer; J. B. Newby, A. H. Thompson, and J. G. Hollingsworth, board of censors.

The next meeting will be held at the same place, commencing on the first Tuesday after July 4, 1889.

WILLIAM CONRAD, *Corresponding Secretary,*
Hotel Beers, St. Louis, Mo.

WISCONSIN STATE DENTAL SOCIETY.

The eighteenth annual meeting of the Wisconsin State Dental Society was held in Milwaukee, commencing July 17, 1888, the sessions continuing for three days.

President Walter F. Lewis delivered the annual address, and several essays were read on subjects of current interest to the profession. A committee was appointed to prepare a book, which shall be the property of the society, on popular information about the teeth.

The following officers were elected for the ensuing year: W. H. Carson, president; E. C. French, first vice-president; E. F. Long, second vice-president; C. A. Southwell, of Milwaukee, secretary; B. Douglas, treasurer; C. G. Junkerman, W. C. Wendell, and W. L. Conkey, executive committee.

By a unanimous vote Milwaukee was chosen as the next place of meeting.

ILLINOIS STATE BOARD OF DENTAL EXAMINERS.

The Illinois State Board of Dental Examiners will meet on Monday, September 17, 1888, at 10 o'clock A.M., in the State House at Springfield. Candidates for examination must report by that time.

Charles R. E. Koch, *Secretary*,
No. 3011 Indiana ave., Chicago, Ill.

EDITORIAL.

MEETING OF THE NATIONAL ASSOCIATIONS.

By the time this number of the Dental Cosmos is in the mail the Southern and American Dental Associations will be in joint session at Louisville, Ky. (August 28.) It will undoubtedly be a meeting of great interest to the profession, and will establish relations of amity which we trust will bear good fruit in the immediate future. We shall present reports of the proceedings in succeeding issues.

THE INDEPENDENT PRACTITIONER.

The July number of *The Independent Practitioner* contains the valedictory of Dr. Barrett and the salutatory of Dr. W. X. Sudduth, his successor in the editorship and business management. The new syndicate under whose auspices the *Practitioner* is henceforth to be published is entitled "The International Dental Journal Association." At the close of the present volume a new name will be

chosen for the journal, and it is intimated that radical changes will be made in its form and policy.

It is assumed by the new editor that there is a demand by the profession for "independent journalism," whatever that may mean, and we are told that the profession has "outgrown the trade journals of the day," although he admits that these may still be useful in supplying "the demand for which they are intended, viz., the distribution of monthly catalogues." We presume that Dr. Sudduth means by "monthly catalogues" the advertising pages of the journals which the profession has "outgrown." Are we to infer that the *Practitioner* is not intended to carry a "monthly catalogue?" Seriously, we think the new editor would have done better if he had omitted this somewhat stale as well as discourteous fling. Nevertheless, we wish him success in his effort, which he claims is entered upon with "full knowledge that it is to be largely a labor of love," albeit we think that publishers and editors expect, as a rule, material remuneration for outlay of time and money, and we shrewdly suspect that, like the rest of mankind, Dr. Sudduth will not be satisfied to trade the sweat of his brow for anything less substantial than his bread and butter.

OBITUARY.

DR. RICHARD W. ZIERLEIN.

Died, in Washington, Mo., on the evening of June 4, 1888, Dr. Richard W. Zierlein, in the fiftieth year of his age.

Dr. Zierlein began the study of dentistry with Dr. H. J. McKellops, of St. Louis, in the year 1852. In 1865 he removed to Washington, Mo., where he remained in practice until the time of his death. He was modest and retiring in his nature, and a loving husband and father. He leaves a widow and two little daughters to mourn his loss. G. L. F.

DR. STODDARD DRIGGS.

At a recent called meeting of the dentists of Lexington, Ky., action was taken on the death of Dr. Stoddard Driggs. Dr. A. O. Rawls was called to the chair, and a committee appointed, consisting of Drs. T. D. Kelley, J. H. Floore, S. S. Johnson, and F. B. Bosworth, who reported resolutions, which were passed, expressing sympathy with the family in their bereavement; reciting that the community in which the deceased had so long lived and labored had lost a valuable member, and the dental profession a skillful and conscientious brother. It was resolved to attend the funeral in a body, and send the resolutions to the family and to the journals for publication.

BIBLIOGRAPHICAL.

Pamphlets Received.

An Operation for Simple Forms of Entropium. By Frank Allport, M. D., professor of clinical ophthalmology, etc., in the Minnesota State University, Minneapolis, Minn. Reprinted from "The American Journal of Ophthalmology."

Some Remarks on Opening the Mastoid Process. By Frank Allport, M. D., Minneapolis, Minn., professor of clinical ophthalmology, etc., in the Minnesota State University. Reprinted from the "Northwestern Lancet" for June 1, 1888.

Some Retrospective and Prospective Thoughts on Surgery. By Donald Maclean, M. D., professor of surgery, etc., in the University of Michigan. Read before the American Medical Association, May 8, 1888. Reprinted from the "Journal of the American Medical Association" for June 30, 1888.

HINTS AND QUERIES.

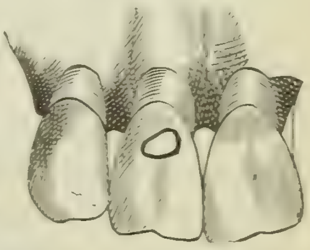
To the Editor of The Dental Cosmos:

Sir: In the August number of the Dental Cosmos, just issued, page 542, is an article on "Dental Inlaying with Porcelain," which begins by stating that this means of repairing carious teeth was first suggested in that journal for December, 1862, by Dr. B. Wood.

I wish to call attention to an article on that subject by Dr. A. J. Volck, of Baltimore, in the *American Journal of Dental Science* for July, 1857, page 322, in which Dr. Volck mentions the fact that the idea was suggested to him by Dr. Maynard, of Washington.

There is more dental literature in existence than many imagine until they study farther back than the present generation. By such study it will be found that many of the so-called new discoveries or advances in the specialty are old ideas, with perhaps, though not always, some modifications in their application.—Jacob L. Williams, M.D., Boston, Mass., August 1, 1888.

As supplemental to the above rectification of the record, we reproduce the illustration used by Dr. Volck, who says: "This operation consists in setting a piece of enamel in the cavity of a decayed tooth when such cavity is exposed to the sight, thereby avoiding the ungainly appearance of gold fillings in the front of the mouth. The only cases in which I have as yet applied this method were in cavities in the anterior surface of the front teeth. It is done by fitting



a piece of enamel into the prepared cavity loosely, walling it into the same by a continuous ring of gold foil."—[Ed. Dental Cosmos.

To the Editor of The Dental Cosmos:

Sir: In the dental profession as a whole there are very few who suspect that cocaïne, whether used subcutaneously or topically, is dangerous. A still smaller number know what antidotes to use, and what remedies should be at hand, in case of alarming toxic symptoms. From a paper entitled "Cocaïne Toxæmia," read before the American Association for the Cure of Inebriates, by J. B. Mattison, M.D., I make the following extracts of his summary and conclusions:

At a meeting of the New York Neurological Society, November 5, 1886, Dr. William A. Hammond, in the course of "Some Remarks on Cocaïne," expressed his disbelief in the toxic power of that drug, declaring he did "not believe any dose which could be taken was dangerous." In a paper by the writer on "Cocaïne Dosage and Cocaïne Addiction," read before the Kings County Medical Society, February 15, 1887,—reprint of which may be had if desired,—evidence was presented to prove this opinion a mistaken one. This proof, furnished by forty different authorities,—English, French, German, Austrian, Russian, and American,—cited more than fifty cases to support the assertion that there is a danger, near and remote, in the use of this drug on some patients that does not warrant such reckless disregard of care as the opinion referred to implies.

The cases noted more or less in detail showed that cocaïne caused toxic symptoms so marked in four as to be fatal. The amount of the drug used varied from a small fraction of a grain to twenty-four grains, and was applied to the eye, ear, nose, throat, larynx, teeth, gums, stomach, bowel, bladder, uterus, urethra, and under the skin. The symptoms noted were nausea, vomiting, headache, deafness, blindness, loss of taste and smell, profuse sweats, cold perspiration, lividity, gastric cramp; frequent, feeble, irregular, intermittent, uncountable pulse; shallow, gasping, irregular, difficult, convulsive, suspended breathing—artificial respiration required in some cases; gait, speech, and swallowing greatly impaired; rigid muscles, palpitation, sense of suffocation and great constriction about the chest; loss of motion and sensation in the arms and legs; general numbness; intense restlessness, extreme prostration, giddiness, faintness, feeling of impending death; unconsciousness, convulsions, paralysis, hallucinations, mania, delusions, delirium,—death.

Summarizing, it was asserted:

Cocaïne may be toxic, sometimes deadly, in large doses.

It may produce dangerous—even fatal—symptoms in doses usually deemed safe.

The danger, near and remote, is greatest when given under the skin.

In further proof of these conclusions, added evidence of over forty cases is herewith appended.

Two more cases of fatal effect from cocaïne have been reported,—one, in dental practice, in Poland; the other in France,—but the writer has not yet been able to secure the desired details. . . .

Conclusions—

There is a lethal dose of cocaïne.

This dose is uncertain.

Toxic effects are not rare.

They may be the sequence of doses large or small, in patients old or young, the feeble or the strong.

This risk should induce caution.

Antidotes should be at command.

These are nitrite of amyl and hypodermic morphia.

I propose to collect and compile as complete a list as possible of records of cases where toxic effects have followed the use of cocaïne at the hands of dentists. Any dentist knowing of such cases would confer a favor on me, and a subsequent benefit to the profession, by describing the details to me, and replying to the following: First, what dose was administered, and whether hypodermically? Second, how long before alarming symptoms occurred? Third, describe same in detail briefly. Fourth, what remedies were used, and which were deemed beneficial? Fifth, if death occurred, how long was it after the administration of the drug, and did the patient have any disease which might have contributed to the same?—B. A. R. Ottolengui, M.D.S., No. 28 West Twenty-sixth street, New York.

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ORIGINAL COMMUNICATIONS.

ETIOLOGY OF IRREGULARITIES OF THE JAWS AND TEETH.*

BY EUGENE S. TALBOT, M.D., D.D.S., CHICAGO, ILL.

IV.

DEVELOPMENT OF THE INFERIOR MAXILLA BY EXERCISE, AND ASYMMETRY OF THE LATERAL HALVES OF THE MAXILLARY BONES.

THE superior maxilla is influenced to a greater degree by the various causes of jaw-deformities than the inferior maxilla. The bones of the upper jaw are in direct contact with the other bones of the body, while the lower jaw, unlike all the other bones, develops independently, and is only attached at its remote extremities by articulation. The growth of the body of the bone is free to develop or to remain in a dwarfed condition, depending wholly upon its blood-supply for its nourishment. The superior maxilla, as has been stated in a previous paper, shows indications of gradually diminishing in size. The inferior maxilla, although under the same influences, has a powerful factor to aid its preservation, viz., motion and exercise. On this account the question presents itself, as to what extent certain properties of the jaws, influenced by habit (use), may be transmitted. The tissues of the body (especially those of the osseous and muscular systems) possess a certain degree of plasticity by which they are enabled to change their weight or shape. This quality depends upon the use of muscles and bones. Among vertebrates we find a close relation between the muscles and the bones upon which they are inserted. The union is made up of tendons, which are prolongations of the muscles to the periosteum, and the periosteum is attached to the bones. Powerful muscles and large bones are always associated, exercise developing them both simultaneously. As outward changes occur in the life of human

beings or animals, adjustment to environment tends to alter the physical characteristics. These changes often occur through such gradual modifications that from one generation to another but little marked difference is noticed, but the structure, in the course of a number of generations, will so change that a new species will be developed. Any animal domesticated from a wild life shows this change, and among human beings the negro imported from Africa will, after several generations, have a less prominent jaw-bone, and the frontal bone will become more prominent.* The changes, although existing in the white races after intermarriage with other nations, are not so pronounced and rapid as in the negro cross breed, but are gradually occurring. No part of the body demonstrates these changes so forcibly as the superior or inferior maxilla. The extremities must be measured and weighed to compare the two halves of the body.

The accustomed eye can at a glance compare the jaws and teeth and observe the slightest deviation. Whatever views are held regarding the origin of man, it cannot be denied that the human jaws of the earlier races resembled those of the anthropoid ape, whose upper and lower maxillæ protruded and were uniform. Observation will show that the changes in the shape of head and jaws are not confined to one race nor to past generations, but are continually progressing. These changes are not uniform in the two jaws. The superior maxilla is a fixed bone, and the inaction from lack of exercise gradually affects and diminishes the volume of bone-tissue from one generation to another.

The inferior jaw, on the other hand, is constantly in motion, which causes a flow of blood to the part, and the activity of nutrition in the muscles and bone increases their size and strength. This increase of the bone by exercise of the part has been alluded to by C. Harting in reports of examinations made. He says that "the bones of the right upper limb are generally larger than those of the left." This increase in size was not confined to one bone, but to all the bones of the right limb. The weight of the right arm without the hand is to the weight of the left arm without the hand as 106.2 : 100, a difference of about six per cent., which would indicate not only an increase in the volume of muscle, but in the weight of the bone. Exercise of the inferior maxilla, which has always existed, has developed the jaw, while the superior maxilla has dwarfed from non-exercise. The contour and expression of the face depend, to a great extent, upon the shape of the inferior maxilla. Fre-

*In some instances, the laws of heredity and sexual selection necessarily co-operate with environment in producing this change.

quently this bone will exhibit peculiar family characteristics in early life. Oftener, family resemblances are not established until the individual has attained his full growth, from the thirtieth to the fortieth year. Hereditary peculiarities may exist at birth, like the transmission of features, or color of eyes or hair, but family likenesses may not appear until middle life, like the contour of the face, shape of the nose, or shape and size of the inferior maxilla. Such being the case, it may be assumed that motion and exercise are the prime factors in assisting the development of the inferior maxilla.

Asymmetry of the Lateral Halves of the Maxillary Bones.

Asymmetry of the lateral halves of the maxillary bones exists in the present era of the human race, and, like other irregularities and imperfections in the structure of the body, it prevails to a greater extent among the idiotic, the deaf and dumb,* and among the offspring of mixed races, than in clannish tribes or nations. Each lateral half of the body develops independently of the other. The jaws, like other members, are influenced by the independent growth of the two halves, so that each has its own peculiarities. Asymmetry, therefore, is caused from an inharmonious lateral development of the parts. The superior and inferior maxillary bones, growing independently of each other, may be subjected to peculiar characteristics of environment, so that the result of their development may be asymmetry of the jaws. Extreme asymmetry of the lateral halves of the human body is frequently observed, and, as some of the recorded cases are of special interest, I will mention a few of them.

Case No. I. Remarkable case of unilateral asymmetry of the left side of the body, in a girl of sixteen years, by Dr. DuPlessis.†

"The doctor presented to the society a rare case of congenital asymmetry, generalized over the whole left side, in a young girl of sixteen years.

"The first thing which is noticed is that the arm and foot, forearm and leg, are in all their dimensions much more developed on the left than on the right side. After close examination the same is found in the arm and thigh, though to a less degree. The shoulder and hip of the same side are likewise greatly developed. The left side of the neck seems much more muscular, owing largely to the enormous development of the sterno-mastoid muscle, and the whole left side of the thorax is also enlarged, though to a less degree.

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* I have in preparation a paper showing the percentage and the relations of the various deformities of the jaws and teeth of the deaf and dumb, idiotic, blind and insane in the public institutions of this country.

† Bulletin de la Soc. Médicale de la Suisse Romande, 1871, vol. v, pp. 24, 30.

"In the face this asymmetry is not so noticeable, except that the left cheek seems larger than the right, owing to the greater muscular development, and also the larger size of that part of the lower maxillary. Above a line drawn horizontally through the orbits, the face does not show any asymmetry.

"The half thoracic circumference, when measured, is much more augmented upon the left than the right side than it seemed at first.

Measurements (in centimeters).

A. UPPER EXTREMITY.

From upper border of to the end of middle finger: Right side, 22; left, 26.

Circumference of forearm at level of styloid process of radius: Right side, 14; left, 16.

Circumference of forearm at elbow: Right side, 21; left, 24.

B. LOWER EXTREMITY.

From patella (upper border) to end of external malleolus: Right side, 33; left, 35.

Circumference of leg at level of malleoli: Right side, 22; left, 24.

Circumference of leg at knee-joint: Right side, 33; left, 35.

C. THORAX.

From xiphoid process of sternum to the spinous process of the opposite dorsal vertebra, or half circumference: Right side, 50; left, 54.

D. FACE.

From external auditory to the middle of chin, along the posterior border of lower maxillary: Right side, 12; left, 13.

"This asymmetry, as in all the cases heretofore noticed, is regular in its proportions,—that is to say, all the elements of the enlarged limbs participate equally in the excess of growth, so that it cannot be said that, although the sides are unequal in size, there exists any deformity. Everything that could be seen or felt was more developed on the left than on the right side. The salient processes of the bones, muscles, veins, in a word everything was equally developed. . . . The pulse seemed larger and stronger upon the left side than upon the right, though this could not be verified without a sphygmograph. . . . In the face the left half of the fleshy part of the lips seemed thicker and more fleshy than the right, as well as the corresponding cheek; but neither the teeth nor tongue nor velum palati, any more than the tonsils and salivary glands, were asymmetric. The ears were likewise normal in size; the hair was equally developed upon both sides. The skin was normal in appearance and color. The temperature was not taken.

"As to the functions, the senses of hearing and of sight, smell and taste were not unequally developed.

"In spite of the inequality in the size of the legs, there was no limping or halting in the gait. The left patella was situated lower down than the right, but it was easy to place them on a level, the pelvis rising upon the left side and lowering on the right; during

walking this oblique position of the pelvis prevented the girl from going lame, but it had caused a compensating curvature of the spinal column.

"The girl could use her left hand to better advantage than the right, and had become quite a remarkable pianist; she was not, however, truly left-handed. Her health had always been good; she did not seem to suffer from the condition described. She was born with these peculiarities."

Case No. II. Observations upon a case of congenital asymmetry of the two halves of the body, by M. Burlet.*

"In March, 1861, Mrs. A. X. came to the hospital. Patient æt. twenty-seven; temperament sanguine; never has had children. She declared that since her birth the right half of her body has been always more greatly developed than the left, but this has always been more noticeable in the foot, leg, and thigh. . ." (There was a coexistent hypertrophy of cellular tissues, but no mention is made of the condition of the bones; it is inferred that they were larger on the right than on the left side.)

Case No. III. By M. Perroud.

"J. G., æt. seventeen, of good constitution, came to the Hotel Dieu, April 9, 1861. Has an aunt who is hysterical; nothing else in this direction. When she was examined we were struck with the disparity in volume presented by the two lateral halves of the body, which, the mother informed us, is a congenital condition. The whole of the left side, without being any longer, apparently, is much larger around than its fellow. This inequality is particularly noticeable in the head, the left parietal protuberance being evidently larger than the right; it is also very noticeable in the limbs, particularly the upper. Some anesthesia of the right side exists, and this has diminished power of motility on left side." (No measurement of bones.)

Case No. IV. By Dr. Paul Broca.†

"Boy, æt. eleven, in whom the two lateral halves of the body are unequally developed. This inequality, recognized by the parents from the earliest infancy, has increased gradually with the growth of the child. . . . I believe that the relative difference of the two halves of the body has always been the same. . . . The left half of

* Mém. et Comptes Rendu de la Soc. de Sc. Méd. de Lyon, 1861–62, i, 225.

† Jour. de la Physiologie de l'Homme, Paris, 1859. 2-70-74.

the body is much more developed than the other. It would seem that the body of this child is formed by the reunion of two halves taken from two individuals differing in age, size, and strength. The measurements given below are in length, but the differences in volume are in proportion and even more pronounced. (Measurements in centimeters.)

	Left Side.	Right Side.	Diff.
Lower limb from the iliac spine to the internal malleolus	65.5	60	5.5
From the iliac crest to the sup. border of the patella	32	29.5	2.5
From sup. border of patella to internal malleolus	33.5	30.5	3
Length of foot from posterior extremity of calcaneum to anterior extremity of big toe	22	21	1
From acromion to styloid process of radius	41	39	2
Length of clavicle	11.7	10.6	1.1

"The right lower limb being 5.5 centimeters shorter than the left, this alone would suffice to produce a considerable lameness; but, besides this, the iliac spine of the left side is lowered about two centimeters, and the lameness is thus aggravated. . . . It seems to result purely from the unequal development of the two halves of the trunk. . . . An inequality also exists in the two sides of the thorax. . . . The dental arch, both superior and inferior, describes a longer curve on the left than on the right side, and the teeth of this latter, for want of space, are very irregularly implanted. . . . The right half of the cranium is notably less developed than the left. . . . The sense of hearing is more acute on the left than on the right side. . . . The left half of the tongue is much larger and thicker than the right. . . . The right eye, strange as it may seem, is much better than the left, while this best eye corresponds to the poorest ear."

Case No. V. Asymmetry of the two halves of the body. By Professor Humphrey.*

"A young woman, æt. twenty, came to Addenbrooke's Hospital on account of an affection of the scalp. I remarked on the peculiar appearance of her face, and was informed by her mother that she was born so, and with one arm larger and longer than the other. I accordingly made a more careful investigation and found that the whole of the right side of the body was larger than the left, the difference being most marked in the upper limb. The measurements are as follows, in inches:

* Jour. of Anat. and Physiol., London, 1870, vol. iv, p. 226.

	Right.	Left.	Difference.
Upper limb	30½	28	2½
Humerus	12¾	11¾	1
Radius	10	9¼	¾
Hand	7¾	7	¾
Circumference of middle of arm	10½	9½	1
Middle of forearm	10½	9	1½
Middle of wrist	6¾	6	¾
Middle of metacarpus	8½	7¾	¾
Lower limb, from ant. spine of ilium to bottom of foot	33¼	32¾	½
Femur	17	16¾	¼
Tibia	14	13¾	¼
Foot	10½	9¾	¾
Circumference of middle of thigh	20½	20	½
Circumference of middle of calf	15½	14¼	1¼
Circumference of ankle	9¾	8¾	1
Circumference of metatarsus	10¼	9¾	½
Circumference of heel and instep	13¼	12¼	1
Chest just above mamma	16⅜	15⅞	½

"I have no doubt that the right clavicle, scapula, and side of pelvis are larger than on the left side, but the difference ascertained by measurements is not positive. . . . The right side of head, in cranial as well as facial part, is also larger than the left. . . . The right teeth, both above and below, are in a plane a little lower than the right; the latter do not appear to be smaller, but they are more crowded, owing to the alveolar arches being somewhat less spacious. She can see equally well with either eye, and hear equally well with either ear, though the right outer ear is larger than the left. The right arm is decidedly stronger than the left. . . . Her mother informs us that this peculiarity is congenital. There is no difference in the pulse in the two sides. . . . No indication of paralysis. Whether the disproportion has been caused by an excessive growth on the one side or an imperfect growth on the other, or both, is not easy to decide. Judging from the more womanly appearance of the left side as contrasted with the more masculine character of the right, I should infer that the fault is one of excess on the larger side."

Case No. VI. A case of asymmetry of the two halves of the body, by J. C. Hubbard, M.D., Ashtabula, Ohio.*

"Master S., a native of this town, æt. nine; father of Scotch-Irish descent; rather under size, a family trait; blood relations of mother are all large people. About five months after the birth of this child the parents noticed that his right hand, foot, and ear were

* Am. Journal of Med. Sci., N. S., vol. lxi, 1871, pp. 289, 290.

larger than on the opposite side. I first saw him when he was a year old. The deformity is undoubtedly congenital. There is but little difference in the size of sides of head, face, and jaws; none in the teeth, mouth, and fauces, excepting the tongue, whose right side is much larger and thicker than the left side. . . . Right eye, ear, and testicle are larger. Penis appears symmetrical when flaccid; when erect, however, the superiority in size of the right corpus cavernosum was found to be remarkable. The right half of the glans constitutes two-thirds of the whole." (No mention of the size of bones.)

Case No. VII. Observation of M. Foucher.*

"M. Foucher presented to the society a patient in whom exists an anomaly of formation which is singular.

"In this man, the left upper extremity is much more voluminous than the right limb, although not much longer. The shoulder is particularly noticeable, owing to its colossal development. Three of the fingers of the left hand, the thumb, the ring and little fingers, are normal in size, while the other two (index and middle) are much larger and longer than their fellows; these two fingers are also curved sidewise and are in contact at their extremities.

"The left lower limb is much larger than the right, but of the same length as the right. The increased size in the left limb does not appear to be due to the same cause as that of the upper extremity, whose increased volume is undoubtedly due to an abnormal development of the bony and muscular tissues, while in the former it seems to be due almost wholly to a thickening of the skin and cellular tissue.

"The remainder of the body is normal; the viscera are also normal in position and volume.

"This man relates that his parents informed him he was born with this peculiarity; this, while admissible for the upper extremity, seems to me doubtful for the lower."

Case No. VIII. Congenital hypertrophy of the limbs of right side. Chassaignac.†

"M. Chassaignac presented to the society a young man, æt. eighteen years, lately received at the Hôpital Lariboisière, to have treated a scrofulous glandular abscess on the right side of the neck. This patient is remarkable by reason of the great disparity that exists between his limbs on the right and left sides of the body. The

* Bull. de la Soc. Anat de Paris, 1850, 25-108.

† Bull. de la Soc. de Chir. de Paris (1857-58), 1858, p. 432.

limbs on the left side are of the size of an ordinary person, while those upon the right would appear to belong to a giant. The different parts of the extremity are not, however, equally developed. The hand is much more developed than the arm or forearm, its external half more so than the internal half. The thumb, the index finger, and the middle fingers are relatively longer and more voluminous than the other fingers.

"On the lower limb the leg and thigh are less developed than the foot, which is truly colossal. The first toe is immense, but relatively less developed than the others on the same side.

"This man affirms that he has at least three times the strength in the limb of the right side than in the left."

These cases are so marked that they are noticeable by the most casual observer. In measuring the lateral halves of the body by the system of measurement of criminals and convicts introduced some years ago by M. Bertillon, we shall find that the halves do not harmonize in a single instance. These differences are not altogether inherited or natural, but have been acquired, to a certain extent, by exercise of the part. Marked illustrations of development by exercise are seen in the blacksmith, whose right arm is larger and will weigh heavier than the left. The peddler who carries a pack has the side most in use developed more than the other.

If exact measurements of the maxillary bones could be made, a lack of harmony in the lateral halves would be observed in weight, shape, and size. The difference is generally not sufficient to affect the contour of the face, but causes faulty articulation to the teeth upon that side of the face. The deformities of either lateral side of the superior maxilla are not necessarily like those of the inferior. Excessive growth or arrested development appear upon both sides of the jaws, sometimes on the right and again upon the left. Examinations of these deformities can be made only when the second teeth have been extracted and the alveolar process has been absorbed.

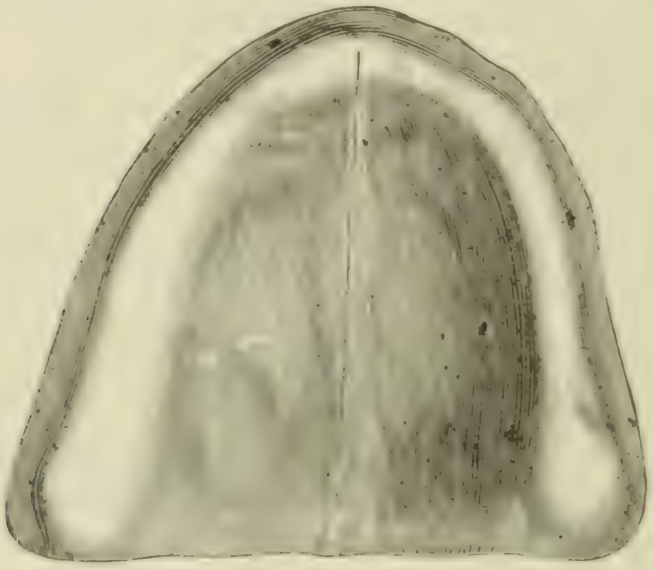
Fig. 1 shows the superior maxilla after absorption has taken place. If a line be drawn through the jaw at the median line, it will be seen that the left half is fully developed, while the right half is contracted at the bicuspid region. The following statistics show the deformities in the contour of jaws modeled by Dr. L. P. Haskell, of Chicago, who has a large collection of models, and who kindly assisted me in their examination:

UPPER JAW.

Total No. examined	298
Total No. normal	137
Total No. abnormal, right side	73
Total No. abnormal, left side	88

Fig. 2 illustrates the inferior maxilla after the teeth have been extracted and absorption of the alveolar process has taken place. By drawing a line through the center of the lower jaw at the

FIG. 1.

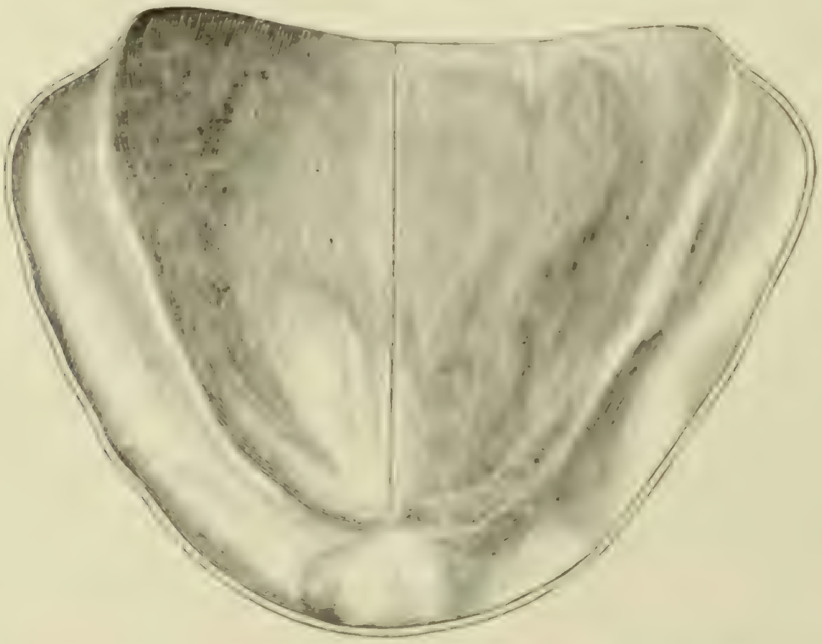


median line, a wider space may be seen to exist between the line and the left side than on the other side.

LOWER JAW.

Total No. examined	154
Total No. normal	54
Total No. abnormal, right side	12
Total No. abnormal, left side	88

FIG. 2.



The following is an extract from a paper by Dr. V. Gallippe, entitled, "Are Right and Left Handedness Functions of Education or

of Heredity?"* "In a work published in 1884 upon the physical properties and chemical compositions of the teeth, I had brought to light the quite unexpected fact that the teeth on the right side are larger than those on the left and are also of greater density. Not only is this true of the permanent teeth, but we have been able to establish the fact that it was also the case with the milk-teeth, and that these latter were more apt to decay upon the left side than on the right." Since the above appeared I have endeavored to decide the matter for myself by examining carefully my patients' teeth and a large collection of models. After four years' unprejudiced study of the subject, I find the majority of jaws contain teeth of the same size upon the right and left sides. Dr. Gallippe's theory is, that, as the majority of people are right-handed, the food is carried to the right side of the mouth, and mastication upon that side produces larger teeth and maxillary bones. I agree with him in that the exercise of an organ may increase it in length, weight, and volume, but I do not think the teeth can be increased upon either side by exercise after antagonism is complete, for the following reasons: 1st. The germs of the temporary and permanent teeth are formed in the jaws before their eruption. 2d. The crowns obtain their shape and size before they come through the gum, therefore exercise by direct contact is impossible. 3d. After eruption, density of the enamel would prevent change in shape or size.

That exercise will increase the density of tooth-structure is a fact too patent to admit of controversy, but that the teeth should be more dense on one side than the other is questionable. Because a person is right- or left-handed the food does not of necessity remain to be masticated upon that particular side of the mouth. The loss of teeth upon either side, or the condition of the teeth, as well as habit, control largely the disposition of the food in the mouth.† This theory of the development of the lateral sides as regards the teeth also applies to the development of the maxillary bones. It will be observed that Dr. Gallippe confines his examination to the size, shape, and abnormalities of the teeth in the arch and not to the jaws themselves, as noticed in his conclusions.

In the study of irregularities of the teeth during the past eight or ten years, I have observed that, although no two cases of irregularities of the teeth are exactly alike, there is a general similarity of shape and outline of alveolar process and jaws, owing to similar

* Journal des Connaissances Médicales Prat. et de Pharm., Paris, 1888; iv ser., vol. x, pp. 242–244, 251, 252.

† It is not probable that a disparity in the amount of mastication upon the two sides of the jaws would markedly modify the relative blood-supply,—a necessary circumstance, if asymmetry of teeth and jaws is to result.

environments during eruption of the teeth. Upon the hypothesis that the two halves of the superior maxilla are developed in proportion to the excess of food masticated on one side or the other, depending upon right- and left-handedness of the individual, we suppose that the case illustrated is that of a left-handed person, as the left side of the jaw is larger. But it appears that this side is normal in size and the right is deficient in development. Dr. G.'s theory, therefore, will not explain the deficiency, and we must look for a more decided cause. By examining carefully the contour of patients' teeth, we shall observe that but few arches are uniform. While one side may be normal the other will be depressed. Fig. 3 shows such a deformity. This cut is taken from the model of an extreme case of irregularly-shaped jaw. It represents a perfect semi V-shaped arch. (I find in my collection of models thirty-eight of this variety

Fig. 3.

of deformity, twenty-four of which are on the right side and fourteen on the left.) Most of these irregularities are not quite as depressed at the cuspid region as the cut indicates. No two are exactly alike as regards the position of the teeth, and yet the similarity is so complete that a non-professional man would immediately take notice of it. The asymmetry of the jaw illustrated in Fig. 1 is probably caused by the peculiar arrangement of the permanent teeth in the arch, since the deformity is not apparent during the first set of teeth, the alveolar process and maxillary bones being molded into this peculiar shape thereby. Since but few people are left-handed, this percentage is very large, showing twenty-four out of thirty-eight cases with deficiencies on the right side, when we might look for normal or excessive development on that side, according to Dr. G.'s theory. The cause of this irregu-

larity I believe to be local in its origin,—viz., too early extraction of the temporary teeth upon the affected side: thus showing that one side is as liable to be affected as the other. The mechanism of this irregularity will be found under the head of local causes.

The asymmetry upon the lower jaw may be traced to two causes. 1st. The full number of teeth retained upon the long side. If the third molars should develop on one side only, the jaws on that side would expand by the crowded condition of the teeth and extend farther from the median line than otherwise. The loss of the third molars by extraction or non-development would prevent the other side from increasing to the natural size. 2d. The relation of the upper teeth to the lower teeth. The articulation of the inferior maxilla with the cranium is so remote and the contour of the two bones so unlike, that uniformity of bone-structure cannot be looked for. When we consider the complexity of the development of bone-tissue, first of the maxillary bone, then of the alveolar process, and lastly of the two sets of teeth, it is a wonder that harmony ever prevails.

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THE RATIONALE OF THE CONSTRUCTION OF ARTIFICIAL CROWNS FOR THE ROOTS OF NATURAL TEETH.

BY DR. J. J. R. PATRICK, BELLEVILLE, ILL.

(Read before the Joint Meeting of the American Dental Association and Southern Dental Association, Louisville, Ky., August, 1888.)

It is generally conceded by well-informed members of our profession that all roots of natural teeth that are in a healthy condition are available as substructures for artificial crowns; but the construction of artificial crowns and their adjustment to the natural roots of teeth are not, in my opinion, sufficiently understood. I will therefore ask your attention while I present a few principles that are involved, which, if not recognized, must result in defective work.

In order to secure the best results in attaching an artificial crown to the root of a tooth, a gold band encircling the root of the tooth. and passing between it and the gum, is the first step in the process. after the root is prepared. Success will depend on the nice adjustment and close fit of this band to the tooth-root; for I maintain that a band of gold fitted to the root of the tooth to be crowned is indispensable, and the first requirement in constructing an artificial crown.

The difficulty in fitting a band to the root of a tooth consists in the fact that it makes no difference what tooth-root you are prepar-

ing for a band, you are dealing with the base of a cone, and the farther you go down from the base with the band the poorer the fit. The reason I mention this is because I have seen so many crowns put on by very good practitioners which had to be removed, and when removed exposed the defect I have mentioned. The portion of the tooth which you have to deal with is the thicker end, and you have to drive your band over it; and the farther you go down,

FIG. 1.

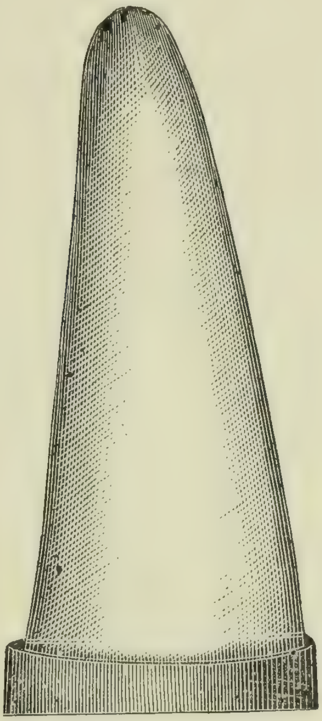


FIG. 1 *a*.

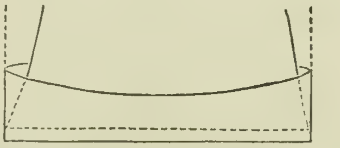


FIG. 2.

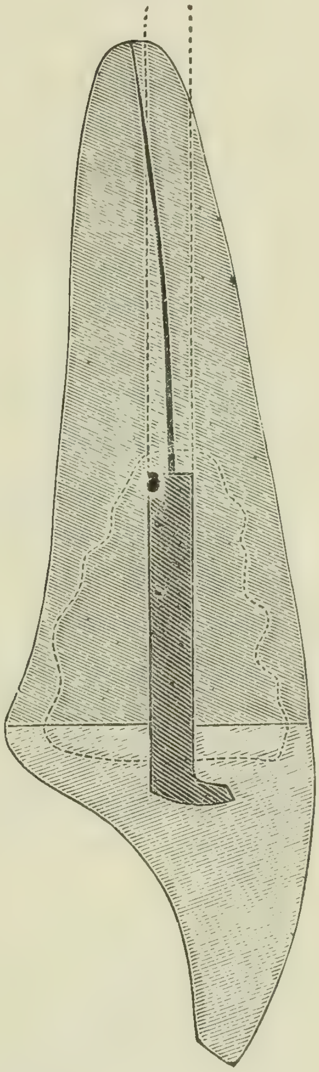


FIG. 1.—Band driven onto a root squarely.

FIG. 1 *a*.—Diagram of the same.

FIG. 2.—Vertical section through root, crown, and post. Dotted lines show direction of post and also the uneven space excavated in the root for the lodgment of cement or amalgam to give anchorage to the crown and post.

as I have said, no matter how beautifully the work is finished, the poorer and weaker it will be, for the reason that the band will stand out from the tooth more or less, in proportion to the distance it is driven on, leaving a space between the root and the band, excepting at the actual line of contact (Figs. 1 and 1 *a*).

All roots of teeth have canals, or a canal. The canal follows the external form of the root. There has been much importance at-

tached to posts as a means of stability for the attachment of crowns, but unless a post taper in conformity with the canal of the root, it is an element of weakness. If you use a post that is not tapering the canal must be enlarged to suit the post, and whether the post is threaded or plain the result will be the same, weakening the point of attachment, and the farther such posts enter the root-canals the weaker the attachment becomes (Fig. 2).

If a smooth tapering post be used, either square or round in form, previously fastened to the crown, either soldered or baked in the crown, the fixed point of the post becomes an element of weakness; for the crown and post become a lever to drag the tapering end of the post from the canal. Now, a tooth-crown with a post permanently attached could not be used in connection with a gold or platinum band to embrace accurately the periphery of the root, for of necessity it would have to go on straight, and, doing so, the band in its relation to the root would be in the condition shown in Fig. 1.

If, however, a post can be used to advantage (which is seldom the case), two fixed points would be preferable, but, unfortunately, impracticable; one, however, can be obtained, and that one is in the end of the post that enters the root. The post, when one *is* used, should be a conical screw, the screw end a little larger than the natural root-canal, the blunt end split and slightly spread apart so as to take hold of the cement in the artificial crown. A porcelain tooth with a pin, or post, baked in the body, can never be ground to fit the surface of the root presented. Of necessity the root-canal must be enlarged in order to procure space and as little surface-contact as possible, the intervening space filled in with plastic material,—*the natural substructure weakened to accommodate the superstructure* (Fig. 2).

All the roots of teeth in the human mouth cannot be utilized for post anchorage. Such as may be used under ordinary circumstances with safety may be enumerated as follows:

The superior incisors, cuspids, palatal roots of the first and second molars, and, if great care be exercised and delicate posts used, the palatal canals of each of the bicuspids. Thus we have fourteen root-canals out of twenty-six enumerated, that may be utilized for post anchorage, if a canal post be used. Now, it will be observed that there are the same number of root-canals in the corresponding teeth of the lower jaw; but the bicuspids of the lower jaw have but one canal in each tooth-root, the upper ones, two; and the incisors of the lower jaw have two canals each, whereas the upper incisors have but one each.

Where a root-canal is small, as in the lower incisors, a conical post without a screw point would be useless, as the canals do not

admit of enlargement sufficient to receive the quantity of cement necessary to secure it in place; whereas, a conical screw point does not require the assistance of cement to keep it in place, and it is constructed and selected with reference to the size of the canal in each root of each tooth, so that the twenty-six root-canals of the teeth of each maxilla can be provided, when necessary, with a conical screw post, without enlarging the natural canal, which cannot be done with any other form of post.

The use of a post in a natural root to give stability to an artificial crown is by no means necessary in the greatest number of cases, and while its use is sometimes indispensable to success, nevertheless I consider the band that surrounds the root a more important factor of stability, when properly adjusted. When we reflect that there is not a root of a tooth in the human mouth but presents the base of a cone to the operator, and that this base has an under-cut around it, it becomes an easy matter to bevel one-half of the base, leaving the other half under-cut; then bend a ribbon of gold in the form of a hoop, approximating the size of the root, with its ends bent at right angles from its circumference, and slip it down between the gum and the root, a little below the beveled portion, then, with a pair of parallel pliers, seize the free bent ends of the hoop and pinch them together, remove the hoop, or band, cut, slightly lap and solder. The band thus made, after the joint is made smooth, is again put on the root by first pushing one portion of its edge under the under-cut and forcing it over the beveled side with a foot plugging instrument, assisted by a few sharp taps of the hammer. If the band is the right size, it will tuck in under the bevel, if not forced down too far. *The band must just pass the lower edge of the bevel and no more.*

The band being in place, the next step will be to adjust the grinding-surface of the crown to the occluding tooth. If there is plenty of room, the crown may be telescoped over, or inside of, the band, but usually it is placed in simple contact or flush on the band. The operation of adjusting the occlusion is accomplished by putting the crown in place on the band, when, the jaws of the patient being brought together, the opposing tooth will indicate on the metal crown the depressions or projections necessary to be made. The alterations on the engaging face of the crown are produced by the use of adapting pliers (Fig. 3) made expressly to give the proper surface projections and indentations. The occlusion perfected, the crown is then removed from the mouth of the patient and the cusps filled solid with solder. The band is then lifted from the beveled side of the root, soldered to the crown, and finished.

It will be observed that the counterpart of the opposing tooth can

be obtained upon the artificial metallic crown, without reducing the thickness of the metal by subsequent grinding. The time and endurance of the patient are saved, and a needless waste of material avoided.

In setting the crown on the root permanently, it will be observed that when the band was forced upon the root it was adapted to the root contour by stretching, and when removed to be soldered to the crown it was again slightly stretched. This can be shown by the ease with which it can be put on and taken off a second time. So in order to have the band fit the root as tightly and as perfectly as it did in the first instance, it must be reduced slightly in size by shrinking, and this is done by the use of a shrinking die. The crown now being ready for adjustment, is filled with cement in sufficient quantity and carried to the root, the band portion of the crown pressed close under the under-cut, and then pressed to and over the beveled side of the root, stretching it as before, when the excess of

FIG. 3.

FIG. 3.—Reversible adapting pliers for the occluding surface.

cement will be forced out, and at the same time carry with it all air-bubbles that otherwise would remain if the crown were put on squarely.

It may be asked how a crown provided with a band could be put in place, if the root had been previously provided with a conical screw post. To which I will reply: If it is a gold crown, a post can be used that will extend above the root one-third the depth of the hollow crown, which will be found sufficient, for nothing would be gained in anchorage by extending it farther. In such cases the crown would be brought squarely down on the post, then tilted over to the under-cut side of the root, and again pressed over to the beveled side, and pressed home. As a rule, the most pronounced

under-cuts of the posterior teeth are found on their anterior and posterior surfaces, and on the cuspids and incisors that bulbous portion at the site of the termination of the enamel on the posterior or palatal surfaces, and these are the points to take advantage of.

In putting crowns on the superior anterior teeth, the bands should be pressed below the bulbs and carried forward to the front, or labial sides. When so inserted, the pressure on these teeth in mastication can never disturb them (Fig. 4). It will be observed that

FIG. 4.

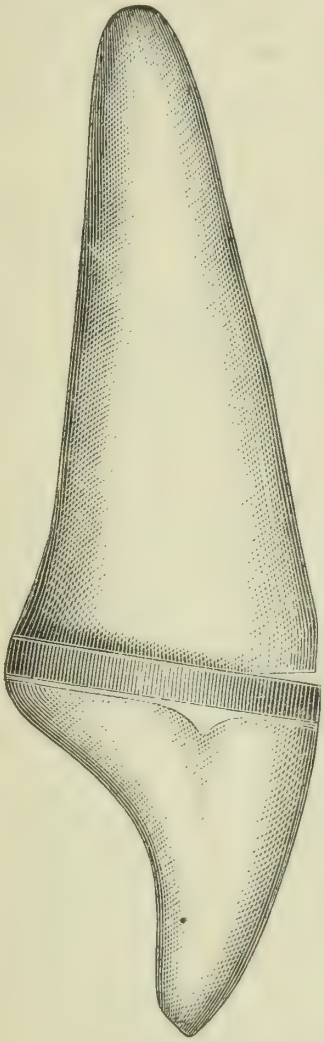


FIG. 4 *a*.

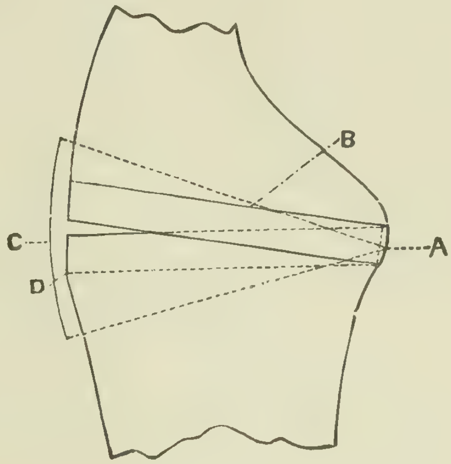


FIG. 5

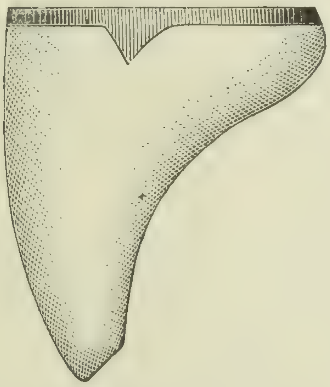


FIG. 5 *a*.

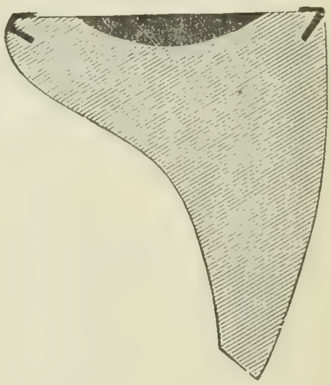


FIG. 4.—Perspective view of crown in position ready to be carried over the bevel.

FIG. 4 *a*.—Diagram of same—A, vertex; B, radius; C, arc; D, point of contact of the band with the bevel on the tooth-root.

FIG. 5.—Perspective view of porcelain crown.

FIG. 5 *a*.—Vertical section through the same, showing the position of pins and platinum band.

when a band is pressed close to the under-cut and held firmly in place, making it a center for the movement of the band, the point becomes the vertex of a radius which the band represents; and when brought down over the termination of the bevel, describes an arc, the angle of which in most cases would be about thirteen degrees. Now if the lower portion of the band is made to impinge the bevel side a little above its termination so that a degree of force will be

necessary to carry it over, the band will stretch, and in stretching its lateral portions will be constricted and adapted to the lateral under-cut margins of the root. From the fact that the band is made to describe an arc when being adjusted, it is clear that as it passes over the bevel it draws nearer to the tapering root, whereby a closer fit is secured than can be made in any other manner (Fig. 4 *a*).

The posterior and anterior contour of the cervical portions of the inferior incisors are about equal, the lingual side of the cuspids similar to the upper, but the pressure on these teeth being inward, they receive additional strength from lateral pressure. A little practice with bands on the natural roots of teeth out of the mouth, observing the points I have indicated, will convince any one of the correctness of these statements.

I have stated that it was seldom necessary to use a post of any kind when a band encircles the root properly, and it is with this view that I have constructed a porcelain tooth crown with a platinum base, or band, encircling the cervical margin, baked into the body of the tooth. The tooth is without pins in the ordinary sense, and admits of the surfaces and margins being made in the true form of a natural one (Figs. 5 and 5 *a*).

The advantages these teeth possess over others may be stated briefly. 1st. They can be attached to the band that encircles the tooth in one soldering. 2d. Moisture is effectually excluded from the cement. 3d. They can be ground down without fear of exposing pins. 4th. They are stronger, from the fact that the point of attachment encircles the whole tooth at its cervical border, or margin. 5th. They can be soldered together at their lateral margins, a quality which renders them useful for bridge-work. 6th. All crowns of teeth in the human mouth where bands can be used can be reconstructed by their employment, including the inferior incisors, which is almost impossible with any other form of porcelain tooth. 7th. They can be soldered to the band at any inclination, as the base of the tooth resting inside or on the band can be rotated like a ball in a socket.

Porcelain crowns for the posterior teeth are made in the same manner. A molar tooth can be placed on the band at the inclination desired to occlude with the opposing tooth, the metal base marked with a sharp instrument, the band and crown removed, the crown imbedded and the band adjusted and soldered to the base of the crown at the inside of the band, and then the crown is ready for insertion.

There are many teeth which can be treated successfully with gold crowns or caps, in which the band, which is indispensable in the process of reconstructing a crown on the root of a tooth, is dispensed

with. I refer to the molar teeth of young persons, in which the enamel of the grinding-surface is defective,—granular, full of pits, and pin-point spots of decay. Usually such teeth are superficially decayed at the anterior and posterior surfaces, but not far enough advanced to expose the pulp in removing the defective parts. If the posterior and anterior surfaces are trimmed at right angles with the grinding-surface and the prominent portions of the surface removed, a gold cap or crown can be made to cover the defective parts, and if properly made and adjusted will be superior to any gold filling, however well performed. In the accomplishment of such work less preparation of the tooth is necessary, more of the tooth-substance is saved, and, consequently, the patient is relieved from a long and tedious nervous strain in the operation, for the crown or cap is made in the laboratory in a few minutes, and, when the process is understood, it takes but a few minutes more to adjust it in the patient's mouth. [Here a natural tooth was shown, the crown covered, as described, with a gold cap.]

I am very well aware that gold crowns can be made and attached to the roots of teeth, after a fashion, and to answer a purpose. I am also aware that porcelain crowns are manufactured and used, with a total disregard of the living parts to which they are designed to be attached. Very clever and ingenious men, with commendable industry, do produce gold crowns, made up of solder, shreds, and patches, whose estimate of the value of their own productions is based on the amount of labor expended on the work with the fewest number of tools, rather than on symmetry of construction with the smallest expenditure of labor and the least amount of solder.

A gold crown should be made of one piece of metal, and when formed should be of uniform thickness throughout. This cannot be accomplished by driving a flat piece of metal from which the crown is to be made, into lead with a hard die, or driving the metal into a hard die with lead. In either case the metal plate becomes of unequal thickness, the margin of the grinding-surface becomes thin, and the sides are thrown into unequal folds; these folds when beaten down cause the sides to become thick in places. If the folds are cut out and the opposing parts brought together and soldered, the pliability of the metal is destroyed. I have stated that a crown made up of metal, to be of value, should go on to the root, or, if a cap, on to the crown of a tooth, with a stretch, in order to adapt it to unequal surfaces. It will therefore be conceded that uniformity of thickness in the metal and the smallest quantity of solder compatible with strength are important factors in the accomplishment of the desired end.

The choice of material from which a crown or band is constructed is of equal importance with the manner of adjustment, for, if the metal is refractory or too pliable, our success will fall short of our expectations; stability and adaptability combined are the properties required in the metals used for bands and crowns, and these properties are obtained in the following formulæ:

CROWN GOLD.

Pure gold	15 parts
Platinum	1 part

Cyanide potassium, 5 parts fused in a coke fire for 30 minutes at least

BAND GOLD.

Pure gold	1 part
Gold coin	1 part fused

NO. 1 SOLDER.

Band gold	89 parts
Pure silver	7 parts
Pure copper	4 parts
Borax	10 parts fused

NO. 2 SOLDER.

Solder No. 1	89 parts
Pure silver	7 parts
Pure copper	4 parts
Borax	10 parts fused

The formulæ of alloys here given for gold solder will be found to contain all the following properties in a high degree:

1. Two surfaces of gold are caused to unite with solder, partly by cohesive force and partly by chemical attraction, and it follows that the solder used should not only be more fusible, but should have a strong affinity for the gold without impairing its natural qualities. For this reason, *all gold solder should be made from the gold that it is to be used with.*

2. When gold solder is used to unite two surfaces of gold that are expected to stand much strain, it is a matter of first importance that the solder should be as near the quality of the gold as possible. No baser metal than copper should enter into its composition.

3. The solder should be as malleable and as ductile as the gold that is soldered, and, when polished, be the same color as the gold.

These separate combinations of metals are rolled into plate the thickness of No. 29 or 30, American standard gauge, and, after annealing, are ready for use.

In constructing a gold crown, the crown gold plate is put between a cutting punch and die, the punch and die being secured in a press, and a circular blank is cut at one stroke from the gold plate (Fig. 6). The cutter and die are removed from the press and a plunger

and cupping-die inserted; the blank is now placed in the countersink of the cupping-die, which gives it the true center. This done, the plunger is brought down and the blank is forced through the die, which forms the cup (Fig. 7). The plunger and die being removed, a hammer is placed in the press in the same manner as the

FIG. 6.

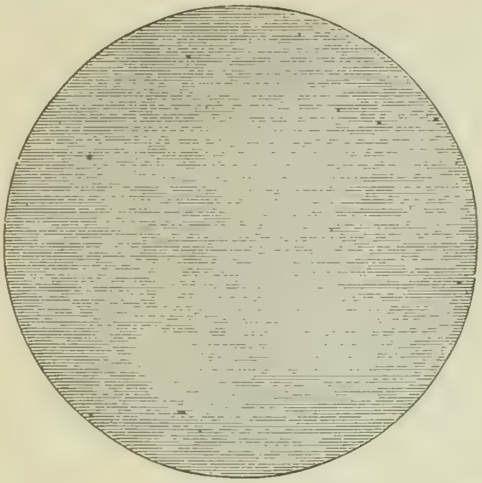


FIG. 7.

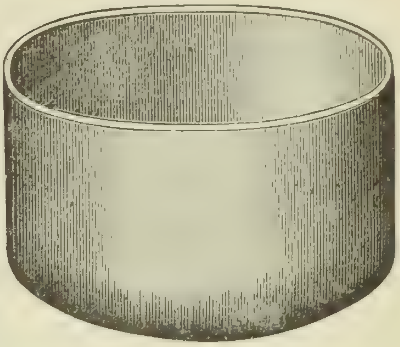


FIG. 6.—Blank for gold crown.
FIG. 7.—Blank formed into a seamless cup.

cutter and plunger. The tooth die in relievo is selected with its corresponding intaglio die. The die in relievo is pressed into the annealed cup, the cup and die placed in the intaglio die, and both are put under the hammer and pressed together. This completes

FIG. 8.

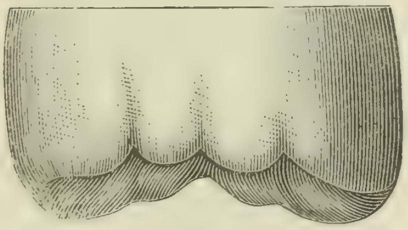


FIG. 9.

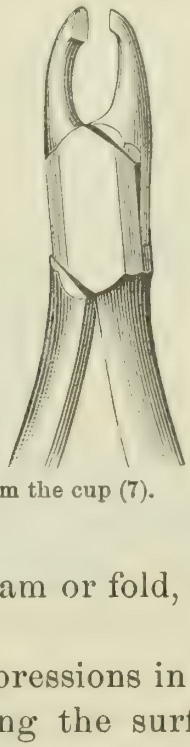


FIG. 8.—Anterior view of a gold crown formed from the cup (7).
FIG. 9.—Reversible contouring pliers.

the process. The crown is made without a seam or fold, and of uniform thickness throughout (Fig. 8).

It will be observed that the cusps and depressions in the crown made by this plan are produced by changing the surface of the metal without making it thinner, as the dies fit each other to begin with, less the thickness of the metal used. The depressions on the

surface of the crown are produced by reversing the contour of the bottom of the cup, and that portion of the cup which is not depressed forms the cusps with very little pressure. This change in the surface of the metal could not be made upon a flat surface without reducing its thickness at the indentations. What we need in a metal crown is the general outline of a natural tooth, not a perfectly cusped tooth; for experience teaches that where metal crowns are used, the occluding teeth are worn, and the artificial crown must correspond to be of service; consequently, the cusps of the metal crown must be depressed, and hence the necessity of the adapting pliers (Fig. 3).

The sides of a metal crown require to be modified to meet the requirements of each case. To meet this necessity the reversible contouring pliers are provided (Fig. 9). These pliers are indispensable in adapting a band to the root of a tooth where the under-cut is taken advantage of. Especially are they useful in forming the bands to fit the lingual, puffy margin of the six anterior superior teeth.

That the roots of natural teeth, when in a healthy condition, are valuable as substructures for artificial crowns is no longer a question, but the extent to which reconstruction may be resorted to is a question yet to be determined.

I have two cases in point that I desire to present for your consideration. A gentleman consulted me in regard to a right superior first bicuspid that a short time previous had been broken in an attempt to extract it. The fracture occurred a little below the thin edge of the process. As the prospect of giving him relief from his suffering by attempting the extraction of what remained of the root was exceedingly doubtful, I concluded to destroy what remained of the pulp; to this end I prepared a short canula by turning up into a scroll a piece of thin platinum, the ends overlapping. This I slipped into the orifice. After cleansing and drying, I could see the condition of the fracture and what remained of the pulp; applied the usual drug for its destruction and filled the canula with wax, by which means the soft parts were distended and prevented from closing. The day following, removed the canula and the dead pulp, cleansed the parts, adapted the canula to the periphery of the fractured root, and obtained an impression of the fracture with impression compound packed into the canula. Made a cast from the impression in hard plaster, and burnished thin platinum foil on its surface, annealing several times. The platinum canula was adjusted in size to the periphery and inequalities of the fracture, and soldered in place to the thin platinum foil, which now formed the base of a cup. The walls of the cup were then strengthened by introducing a

scroll of thin platinum, and the base of the cup was made strong with solder. (*The solder I use for platinum is always pure gold.*) Two holes were next drilled through the base of the cup in correspondence

FIG. 10.

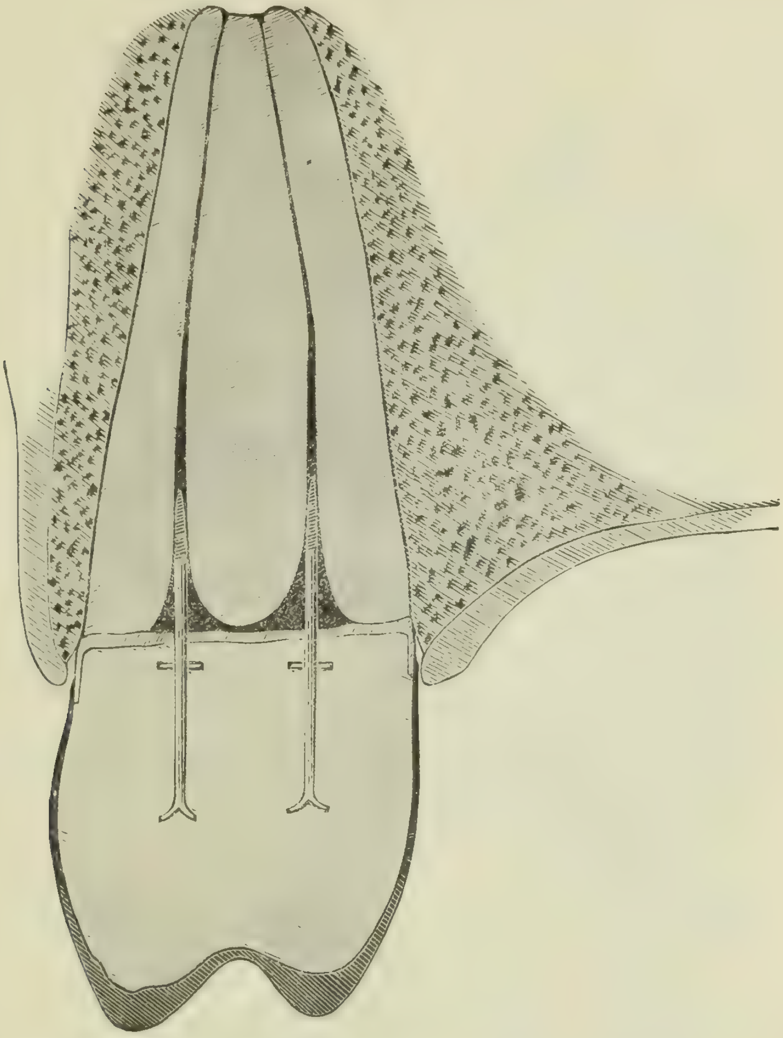


FIG. 10.—Vertical transverse section through root, reconstructed part, posts, and gold crown.

FIG. 10 *a*.

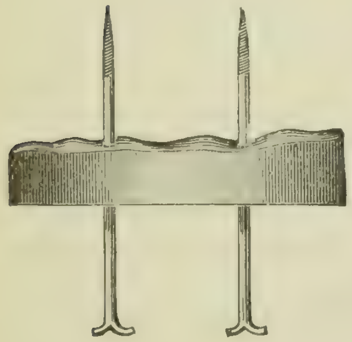


FIG. 10 *b*.

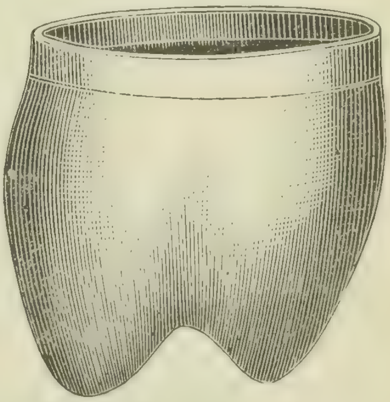


FIG. 10 *a*.—Perspective view of reconstructed part and conical screws.
FIG. 10 *b*.—Perspective view of the gold crown.

with the root-canals, conical screws introduced and marked at the base of the cup and then removed. Small washers were then slipped on to the screws to the point marked, and soldered. After finishing

the outside of the cup a light film of liquid gutta-percha was spread over its base, the surface of the fracture dried, the cup put in place, and the screws introduced and screwed tight to the fractured root. The cup was then filled with cement and the gold crown telescoped over it (Figs. 10, 10 *a*, and 10 *b*).

Figs. 11 and 12.

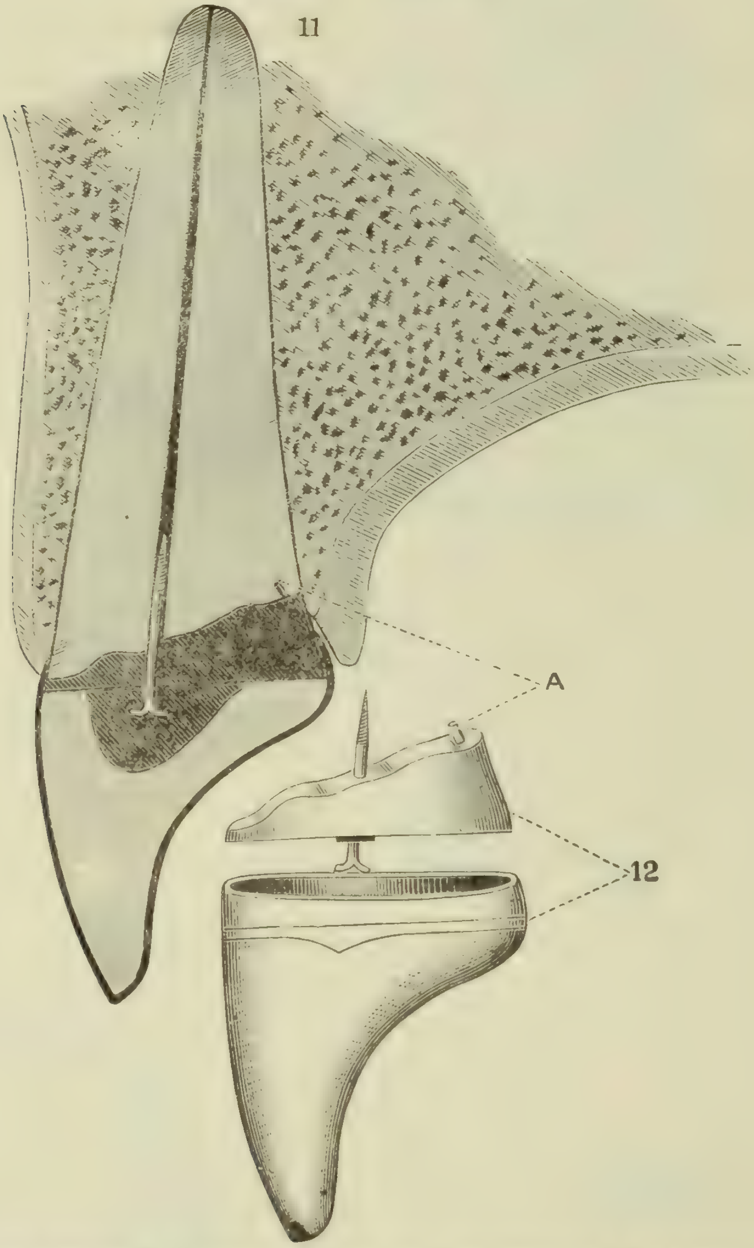


Fig. 11.—Vertical section of left central incisor from the posterior to the anterior, showing reconstructed parts in place.

Fig. 12.—Profile view of reconstructed portions in sections. A, the dowel or pin.

The second case is that of a gentleman who was unfortunate enough to have the left superior central and lateral incisors broken off by a blow.

The fractures in both teeth were from the anterior to the posterior, commencing a little above and running down from the cervical border at the labial side to a little below the cervical border at the

expense of the palatal side. The crown of the central incisor was broken into fragments, the crown of the lateral was whole. The process of taking the impressions of the fractured surfaces of these teeth was similar to that in the previous case, but was somewhat more complicated, owing to the obliquity of the fractures.

Fortunately, the crown of the lateral incisor being whole, the surface of the fracture served for the model.

By reference to Fig. 11, which is an anterior to posterior vertical section of the central incisor, and Fig. 12, which is a perspective view of the several parts reconstructed, it will be seen that the work reconstructed under the gum presents an inclined surface to the fracture, and a level surface to the crown; it is, therefore, an acute angle in form and could not be retained with firmness, on the inclined fracture, with a screw alone. Hence the necessity of a pin, or dowel, in the reconstructed part, at the lowest portion of the incline (Figs. 11 and 12, A), soldered into its place at right angles with its inclination, and penetrating the substance of the tooth not more than the sixteenth of an inch. It is plain that when the washer is brought to bear on the horizontal plate of the reconstructed section by the action of the screw, the dowel is carried into the hole designed to receive it, and the reconstructed section becomes a fixture.

It is in all such cases that the conical screw becomes an absolute necessity.

DENTAL INLAYING WITH PORCELAIN.

BY W. STORER HOW, D.D.S., PHILADELPHIA, PA.

(Read before the Joint Meeting of the American Dental Association and Southern Dental Association, Louisville, Ky., August, 1888.)

In continuation of the subject of dental repair by the employment of porcelain inlays as described in the Dental Cosmos for July, 1888, it is to be said that there are further details of manipulation in the setting of the circular inlays, which will here be briefly presented.

For preparing the cavity in the tooth the barrel burs were adopted as being the best instruments at that time obtainable by dentists for whom the operation was described and shown. Since then the writer has had made by the manufacturing company with which he is connected, a set of nine inlay burs which have straight, slightly tapering sides, and are fine cut on their ends and sides.

The primary preparation of the cavity may be done with any form of bur at hand for the purpose,—as, for example, a square-end fissure bur,—and the depth of the cavity be cautiously, yet judiciously determined to be as great as will be compatible with the continued life of the pulp.

The formation of such cavities in natural teeth which have been extracted, and the subsequent grinding of these into sections through the artificial cavity and the pulp-cavity, will afford an experience that will be useful in aiding one to judge how deep the cavities may safely be made in living teeth of like character.

When the primary cavity has been formed and is about to be enlarged by an inlay bur, great care must be taken to hold the engine hand-piece steady to enter the cavity at the proper angle, and to hold the bur so firmly that it cannot run away and mar the cavity margins. Then slowly yet constantly push the inlay bur down to the bottom of the cavity, being very careful not to chip off the edges of the cavity by either too great pushing force or by swerving to one side or the other. It is also necessary that the bur should run quite true in the hand-piece in order that a hole of true and equal taper and also a truly cylindrical hole may be formed.

Failure in any of these points will be made manifest in the finishing process, as this discloses the slightest superficial defects.

The inlay must likewise be ground to a true frustum, and this is a work of more difficulty than might at first be supposed, especially when it is considered that the taper of the inlay is to be made correspondent to the taper of the cavity. With this object in view I have made the grinder-rest here exhibited, consisting of a corundum slab-holder and hand-piece support, which, by set-screw adjustment, enables the operator to rest the nose of the hand-piece on the support at an inclination that will permit the rotating inlay to be held on the slab at such an angle as will impart the desired taper to the walls of the inlay. By this means an inlay can be made of a slightly increased taper in comparison with the inlay bur, and therefore the inlay will touch the cavity all around its superficial border, thus reducing the joining to its lowest degree. The tapers of the cavity and the inlay should, however, coincide as closely as possible, because it will often be necessary to cut down on one side or the other, and that will disclose any increasing separation of the inlay from the cavity.

In still further improvement of the accessories to this operation, brass mandrels have been made, and because they are impervious to the water used in grinding, the shellac will stick the inlays to the mandrels with greater firmness than to the wood points. Two of the mandrels are reversible, and a set of three mandrels serves for the set of four inlays. These have been given such sizes and shapes as were deemed suitable for the meeting of nearly all cases, but if there be an occasion for the conversion of a larger into a smaller size, this may best be done at the laboratory lathe by simultaneously running the engine and holding the revolving inlay again at the rotating lathe-

wheel. As another means for rapid grinding, a corundum slab having a suitably tapered perforation may be employed; or the arbor-hole of a corundum wheel may be utilized; but neither of these modes seem on the whole preferable to that previously described. The two most difficult points in the manipulative process are the formation of a truly round and nearly cylindrical cavity, and the grinding of an exactly corresponding inlay. Another difficulty is the preparation of a permanent cement of a color similar to that of the tooth and inlay. Concerning the permanency of zinc oxyphosphate cements, there is nothing new to be said, and with regard to the permanency of inlays set with this class of cements, there are no recorded data on which to base an estimate of the probabilities of inlay continuance in a given case. The most that can now be said is that some zinc oxyphosphates are enduring in the side cavities in some mouths, and that in nearly every instance its wastage, apart from abrasive or attritional wear, is in lines of concavity, leaving the marginal contact undisturbed. A reasonable inference, therefore, is that the thinner the margin the slower the wastage. Hence it is fair to expect that a very close approximation of the inlay margin to the cavity margin will insure a prolonged duration for the thin intervening septum of connective oxyphosphate. The recent publication of inlay articles has attracted the attention of practitioners who allege the setting of them in zinc plastic cements many years ago, and they can doubtless testify to the more or less staying qualities of the work. On the other hand, it may be confidently anticipated that a class of practitioners will declare that the zinc phosphates are ephemeral in all places in the teeth of all mouths, and that inlay work of that character will be disappointing. That, in fact, it should in no case be advocated, and needs no experimentation to verify its clearly inferential impermanence.

Nevertheless, the experienced dentist will recall cases which (as, for instance, the young lady who had an engagement with some other person than the dentist) he would have been glad to have repaired with an inconspicuous material even though it should certainly be renewed within the year.

It will, however, be conceded that, when the long-expected permanent plastic cement shall have arrived, this inlay process will be deemed an excellent mode of repair, as the samples of inlaid extracted teeth herewith submitted for inspection convincingly attest. No. 1 shows a left superior central having a large labial cavity, and No. 2 a like right central that had a similar cavity, which now has an inlay set in zinc phosphate. This inlay was made from an old cavity-stopper, and is not so dense as the inlays now furnished, nor is its shade closely similar to that of the tooth; but

the operation is obviously, in some respects, an advance upon anything hitherto brought before the profession, and so far as appearances go it would be difficult to excel the similarly inlaid lower right and left cuspids, Nos. 3 and 4, the latter being readily accepted, as it indeed has been, for a perfectly sound tooth.

The vertical section of a central shows the close fitting of the inlay walls with the cavity walls, even after the surface has been cut down considerably around the margins. It also shows the absence of any cement on the floor of the cavity, and that fact in part explains the close contact of the wall; a very essential element of success in the operation.

The color of the cement modifies the appearance of the inlay, which is more or less translucent, according as its shade is light or dark, and the color of the cement should therefore harmonize with that of the inlay when that is like that of the tooth; but when, as must frequently occur, the tooth is not exactly matched by the inlay, this may be toned up or down by a suitably colored cement such as experience only will enable the dental artist to prepare.

A practically permanent inlay can be made with gutta-percha as a joining medium, and the sample No. 6 shows that a very close wall-joint may be made, and the floor also covered, because the mode of manipulating the gutta-percha admits of the complete filling of the cavity.

In practice, the fitted inlay, some preparation of gutta-percha, as Hill's stopping, and the required instruments, are all made hot on a dry water heater, the cavity dried with warm air, the cavity walls thinly lined with the gutta-percha made soft enough to stick to the walls, the inlay put in with a pair of pliers, and quickly pressed home with the hot flat end of an instrument large enough to retain and impart to the warm inlay heat enough to completely soften the gutta-percha and cause all the surplus to exude around the inlay. A cold instrument is then immediately substituted for the hot one, and pressure continued until the normal temperature has resulted.

After a short interval to allow the thorough cooling of the gutta-percha, the surface of the inlay may be ground and polished, and the operation finished at that sitting. No. 7 is an example of a small inlay which has been darkened by a bluish shade of gutta-percha, but the joining is a mere line, and the operation is such as would prove permanent and not unsightly in the mouth.

Too great care cannot be taken not to overheat the gutta-percha, and so darken it; nor to soil it or the inlay or the cavity margins; nor to fail to completely surround the inlay with gutta-percha. Either of these errors will be discovered as a blemish when the polishing process shall be commenced.

No. 8, an upper left lateral in section, shows a close-fitting, yet imperfectly surrounded inlay set in gutta-percha. No. 9 likewise shows one imperfectly set in crude white gutta-percha. No. 10 is an upper right central, having a small inlay set in sandarac, but it, as well as copal and mastic, has a yellow tinge, which is deepened by the melting heat necessary to soften it sufficiently, and hence a darkening of the inlay results.

At the present writing, gutta-percha softened by heat appears to be the best obtainable joining material, all things being duly considered.

The uses of these inlays will not be confined to the circular-form cavities previously described, but in many buccal and crown cavities which cannot be given a circular form, the inlay may be approximately conformed, and set in gutta-percha with very satisfactory results.

In large crown and compound cavities where the pulp is nearly exposed the inlays may be set in cement with their bases inward, and so serve as caps to the pulps. In these instances the cement should extend but half-way up the inlay sides, and the remainder of the cavity be filled with gold or amalgam.

Many cases will arise in which, by notching or otherwise grinding an inlay, it may occupy the bulk of a cavity and present a porcelain surface for mastication, thus in a great degree diminishing the otherwise unsightly aspect of a large metal filling.

PRODUCTS OF THE EPIBLAST.

BY E. R. WARNER, D.D.S., MORRISON, ILL.

In the consideration of this subject, one of the first stages in the formation of the embryo is the division of the blastoderm. This membrane is composed, originally, of two layers of cells, both of which surround the vitellus or yolk of the egg. As the growth continues and the membrane thickens, an intervening layer is the result, making thereby three in all,—an external, which formerly was called the serous layer; an internal or mucous layer, and a middle or vascular layer. These are now termed respectively epiblastic, hypoblastic, and mesoblastic layers.

The principal function of the epiblast is in the formation of the nervous system and sensory portion of sense organs, the eyes, nose, ears, external cuticle, nails, hair, enamel, glands of the mouth, and the outer surface of the body. Hence, according to Haddon, there are four varieties of function, viz., protective, sensory, secretory, and respiratory. The hypoblast develops the main portion of

the epithelial layer of the alimentary canal, and all communicating organs, also the respiratory apparatus. From the mesoblastic layer of cells are formed most of the remaining tissues of the body, viz., connective tissue, circulatory system, cutis vera, etc.

It is the purpose in this paper to describe the epiblastic layer and observe its principal terminations. This layer is subdivided into three, and termed by physiologists the Malpighian or infant layer, the stratum lucidum or older layer, and the corneous or oldest layer.

It is by a process of dipping down or involuting of the Malpighian layer that the several products of the epiblast are formed; in fact, it is in the cells of this layer that the active production of the remaining layers resides. It consists of a stratum of oval cells, which lie immediately above the cutis vera, and, by their multiplication, the first formed cells are pushed toward the surface. They become more flattened, and have a greater amount of formed material within the cell limit. This portion is called the stratum lucidum. Immediately above the latter, and formed of its cells, exists the corneous layer. These cells are large and quite flat, and their nuclei, from the lack of nourishment, have become less distinct, or disappear entirely. The outermost cells become dried from contact with external influences, and are cast off in horn-like scales.

The cells of the Malpighian layer have well-marked nuclei, and in stained specimens are exhibited very much darker in color, while the outer layers take the stain less deeply in proportion to their age. The nuclei of the younger cells are surrounded and immerged in protoplasm, and derive their nutrition from this source.

The walls of the buccal cavity, according to Dr. Sudduth, are formed by the development downwards and forwards of the maxillary bones, which arise by four bud-like processes from the pharyngeal arches, situated on either side of the face. The central portion remains depressed, thus causing an involution of external epithelium, which forms the mucous membrane of the mouth and upper portion of œsophagus, and uniting with the anterior end of the alimentary canal, derived from the hypoblast, makes a continuous nutritive tract. But two layers of cells are visible in the mouth. The corneous layer, although existing, does not exhibit the same appearance as on the integument, because of the moisture present, which prevents it from becoming desiccated. The mucous membrane of the mouth and the integument are, however, the same structure, one being a continuation of the other, and the difference lying in their function.

In taking up a more minute consideration of each product, there are, at a very early stage in the development of the embryo, indica-

tions of the formation of the nerve-centers. The epiblastic or external layer of the blastoderm, by a dipping down along its center longitudinally, forms a groove, which, with a corresponding rise of the sides of the layer, ultimately shapes itself into a medullary canal; within this, and from the inclosed cells of the epiblast, germinal deposits develop the nerve-centers, forming what is later known as the cerebro-spinal axis. The larger extremity of this canal is the portion which develops the important organ, the brain. From this rudimentary state, by the continued growth of the cells, various enlargements and divisions occur, making up the different parts of that organ.

All the nervous and non-vascular portions of the eye are developed from the epiblastic layer. From the rudimentary brain, by a protrusion forward, the retina and its coverings are formed; they are met with an infolding of the epithelium, which, upon thickening, makes the crystalline lens.

The eyelids are small cutaneous infoldings, for the protection of the sensitive portions within. The ears are developed similarly to the eye. The depression of the epithelium over the pharyngeal arches in the embryo is converted into a closed sac, and constitutes the internal ear, into which the auditory nerve is advanced from the brain.

The nasal fossæ, upon deepening, are covered internally by mucous membrane of epiblastic origin.

The nails are flattened, horn-like appendages, situated on the extremities of the fingers and toes, and penetrating to a slight extent underneath a fold of the epidermis, and with some modifications are developed from the same class of cells. For convenience of description, three portions are distinguished,—an extremity or free border, a middle or body, and a root portion. Upon removal of the nail body, a whitish, mucous layer of cells is exhibited. This constitutes the Malpighian layer of the epiderm, the cells being few in number at the free border, but increasing gradually on approaching the root. It is from the latter portion that the growth of the nail is extended, while from the nail bed the thickness is governed.

A difference in color is noticeable in the nail. Near the root, where the cells are the most abundant, the vascular supply from the corium is hidden from view, and presents a whitish appearance. This is sometimes called lunula, from its shape. The cells of the papillary layer are somewhat elongated in form, and have marked nuclei. By their growth the older ones are pushed to the surface, but instead of becoming dried scales as on the integument, they unite together and form the familiar horn-like structure. At the root the nail is thinner and softer than at the free border, because of its

more recent formation. The lengthening is a constant process, and the extension would be indefinite were it not checked by cutting or friction.

The hairs are cord-like, corneous substances, growing from nearly every part of the body, excepting the palms of the hands and soles of the feet. Anatomically considered, they are divided into a root, shaft, and point. From the epithelium the infant layer of cells dips down into the underlying cellular tissue, and in so doing takes a layer of the corium about it; thus is formed a double sac, with the surface end open, the outer tunic of which is composed of tissue continuous with the corium, while the inner and inclosed coat is of cuticular origin. This sac forms the follicle, and becomes bulbous at its lower extremity. It rests upon a highly vascular and nervous papilla of the corium, completely enveloping the free portion. Within this follicle, and deriving its nourishment from the vascular papilla, is the root of the hair, closely attached to the cuticular lining, which forms the root-sheath. The cells of the root are nothing more than developing epithelial cells from the Malpighian layer of the epiderm, which by their multiplication push the older ones to the surface up through the follicles, forming the shaft of the hair. The latter consists of the corneous layer of now slightly flattened cells united together.

The hairs contain within their center, or medullary portion, accumulations of pigment-cells, giving the varieties of color. If the hair-bulb atrophies, the follicle is capable of selecting a new papilla, which proceeds with the development of a new hair, pushing the older one from the follicle; however, should the whole of the epithelial part of the follicle cease growing, a new bulb cannot be formed, and necessarily the death of the hair takes place.

The horns, hoofs, wool, and feathers of the different lower animals are quite analogous to the nails and hair of man. In the horned cells the nuclei cannot be seen unless acted upon by some chemical to change them to their former state.

Among the various glands arising from the epiblast are the sebaceous, sudorific, and mammary glands, on the surface; and the salivary and mucous glands opening into the oral cavity. Though differing materially in their function, they are all developed from the same source.

The sebaceous glands are lobulated structures, looking not unlike a bunch of grapes. Formed from the epithelium by its descension into the corium, it shapes itself into several pouch-like sacs, all of which unite to form a common duct. These ducts open on the surface of the body, or, as is more frequently the case, into the hair-follicle, thence to the exterior. The outer coat of these sacs is

formed from the connective tissue, which rests firmly against the inner coat, consisting of the Malpighian layer of the epiderm. The cells from this layer, forming the inner coat, develop from the infant stage to the older, as in the hair, but instead of terminating in a corneous substance they go through a process of fatty degeneration, and pass out upon the body in an oily fluid, which lubricates the hair and skin. If, by any cause, the ducts of these glands become closed, the secretions are pent up, and, increasing in quantity, form a sebaceous tumor, which frequently occurs.

The sudoriferous or sweat glands are tube-like exits on the surface of the body, for the elimination of excrementitious matter in a liquid or gaseous form. They differ little from the sebaceous glands in origin, being formed from the infant layer of the rete Malpighii. Instead of being lobulated, they exist in the form of a tube, coiled upon itself many times, and passing through the epiderm in a spiral manner. Some of these glands dip down into the subcutaneous tissue, and between their coils and meshes ramify small blood-vessels, from which the glands secrete their product.

The development of the mammary gland is quite a repetition of the description of the previous ones. The gland proper is composed of lobes, forming a compound, racemose gland. The several vesicles communicate to form a common duct, the lining coat of which is composed of mucous membrane, consisting of basement membrane covered with pavement epithelium, which involutes from the surface to the connective tissue beneath. This connective tissue forms an outer coat, within which lie the nerves and blood-vessels, from the latter of which the secretion of the gland takes place.

The salivary are conglomerate, racemose glands, consisting of lobes and lobules, which open into a common duct. They are developed as paired invaginations from the ventral plate of the mouth. The blood-vessels permeate between the tubes and lobes, and supply the glands for secreting purposes.

Various theories are at the present day advanced by different writers as to the origin and development of the teeth, with especial reference to the enamel-organ. Physiologists, however, are quite agreed that the enamel is derived from the mucous membrane or cuticular portion of the mouth. The first evidence of tooth-formation is exhibited at a very early stage of embryonic development, by the appearance of a ridge of slight extent in the epithelium covering the cartilage of the jaws, produced by an increase of the number of cells of the Malpighian layer. At the same time the subepithelial tissue becomes depressed by the multiplication of cells, which depression or band is filled with the cells of the infant layer.

This thickening of the Malpighian layer, making the band, is continued downward at individual points, each corresponding to the location of a temporary tooth. Becoming more and more constricted as they lengthen, they appear, in a microscopic specimen, very much like cords suspended from the mucous membrane. The dentinal papilla, which afterwards constitutes the pulp of the tooth, arises from the connective tissue, but seems quite incapable of progression until modeled out by the enamel-organ. Through the resistance given by the underlying tissue and papilla, the extremity of the cord becomes bulbous, and finally encapsules the papilla in a bell-like manner. There is thus formed, by this enveloping, two coats or tunics of oval cells of the infant layer of the epiderm. This same method of invagination is observed in the development of the hair and glomeruli of the kidneys. According to the tooth to be formed, does the cord assume a single or multiple digitation; in the anterior part of the mouth it is of a simple bell-shape, but with the molars it is likened more to the shape of an inverted W. The cord for the permanent tooth generally arises, in the case of the anterior teeth, from the cord of the temporary tooth; but for the permanent molars it comes, usually, directly from the epithelium and passes quite deeply into the substance of the jaw, beneath the temporary teeth, where it seeks its own papilla, and goes through the same development as in the temporary predecessor. Within the tunics of the enamel-cord are located the cells, which ultimately are instrumental in the formation of the enamel-prisms. After the process of development is fully under way, severance of the cord from the epithelium takes place in a gradual manner, and calcification proceeds.

In conclusion, it may be remarked: In the various products of the epiblastic layer is observed the same method of dipping, or involuting, of the infant layer of cells, and its important part in the proper function of the organ. A strange feature presents itself, in that the cells, microscopically the same, develop in one place a substance totally different from that of another. In the nails, the cells of the corneous layer become fused together and form a hard substance; while in the sebaceous glands they undergo degeneration and form oily matter. Enamel, the hardest substance in the body, arises from this Malpighian layer; while the brain, which is of a soft nature, has the same origin. Another peculiar phase is the descent of the cord-like band of cells, in each case, to a certain depth, and then the beginning of the development of its own organ. This known capability of cells to become certain organs in certain places has led to the advancement of different theories regarding the governing power.

Some writers,—and I believe it is the view of most physiologists,—basing their belief upon facts obtained from observations of the system at large and of some of the lower animals, maintain that it is a law existing in each cell, whereby the same characteristics are transmitted from the parent to the offspring, and that this inherent power was imparted in the beginning.

In the examination of the development of the teeth, the microscope has entered very largely into use; in fact, only through this means have we been able to arrive at the conclusions of the present day.

EROSION.

BY LEWIS A. OBRIAN, JR., D.D.S., PROVIDENCE, R. I.

No theory on this subject, notwithstanding frequent discussion by dental and medical writers, has yet been so set forth as to gain general acceptance. As a contribution to the discussion, the results of microscopic observations and a theory founded thereon are here presented.

The resorption of tissue, especially bone-tissue, lies at the foundation of the subject.

Anatomists are agreed that young bone is inclosed in the periosteum, but separated from it by a layer of soft blastoderm containing a number of granular corpuscles, or osteoblasts, which secrete the lime-salts obtained from the blood, forming around themselves the bone-tissue proper. In long bones the medullary cavity also increases in size as the animal approaches maturity, and on examining the marrow-tissue we find it covered with cells known as marrow-cells, and also with numerous larger multinucleated cells known as giant-cells. A consideration of giant-cells and their functions is therefore a necessity. The reaction of these cells is acid, and it is probably due to the action of this acid that the tissue with which they come in contact is dissolved. This absorption by giant-cells, then, is a purely physiological action, and we find that this action is not confined alone to bone, but includes any foreign substance or irritant found in the body which causes inflammatory action, and which nature therefore desires to remove.

Continued irritation results in partial stagnation caused by the blocking up or damming back of the red corpuscles of the blood by the white corpuscles, which have begun to grow larger and adhere to the walls of the vessels. The pressure forces the white corpuscles through the walls of the vessels into the investing tissues, where they

surround the irritant, forming what is called the "circumvallating membrane." These circumvallating tissue-cells develop into multi-nucleated cells, by reason of the rapid cell multiplication due to over-nutrition.

Usually, cells increase in number by a division of nucleus and cell-substance, but when the nucleus divides without the consequent division of the body, the giant or absorptive-cells are formed.

Some look upon the giant-cell as a pathological structure only; but when we consider its connection with the resorption of bone, it seems certainly to be also a physiological agent. A fact which illustrates this is found in the absorption of the roots of deciduous teeth.

Carefully extract a deciduous tooth, cut away the papilla of tissue found underneath the partly absorbed roots, and place it under the microscope. There can now be seen not only the normal tissue-cells, but also giant-cells, which have been actively engaged in dissolving the temporary tooth to make way for the permanent one which is to take its place.

The normal function of these cells, like that of all other organs of the body, may become pathological; and it is this phase of the giant-cell which brings us to the subject in question,—*i.e.*, erosion.

Erosion is most frequently found at the necks of teeth, where it channels out the tooth-substance sometimes to such an extent as to expose the pulp. In other cases the labial faces of the teeth are seen to be covered with little pits of varying size and depth.

The difference between erosion and caries is easily distinguished, for in the case of the former the affected surface, although being slowly acted upon by acid, presents a hard and polished appearance; whereas in the latter the parts are found to be dull and soft and generally discolored. In all cases of erosion an acid condition can be proven to exist either in the gums or lips by carefully drying the parts and then placing litmus-paper over them. Upon removal it will be found that it has discolored.

The cause of the formation of these absorptive cells is found in the presence of an irritant of some kind. This irritation of the tissues may be produced in many ways; some of the most common are mal-occlusion, hard rubbing with stiff brushes, and the ulceration of some of the many glands found in the lips. The acid thus secreted by the giant-cells, coming in constant contact with the teeth, acts upon them in such a manner as slowly to eat away the tooth-substance, and results in what is known as erosion.

PROCEEDINGS OF DENTAL SOCIETIES.

AMERICAN DENTAL ASSOCIATION.

The twenty-eighth annual session of the American Dental Association was held in the chapel of the Female High School, Louisville, Ky., commencing Tuesday, August 28, 1888.

The association met as a separate body only for the transaction of routine business, the reading of papers and discussions being held in joint session with the Southern Dental Association.

President Frank Abbott in the chair.

Dr. J. N. Crouse, Chicago, was appointed treasurer pro tem., and Drs. H. A. Smith, E. T. Darby, and G. J. Friedrichs were appointed a committee to voice the feeling of the association over the death of its treasurer, Dr. George W. Keely. The report of the committee, which was submitted at a subsequent session, was adopted, and a copy was ordered engrossed for the family of Dr. Keely.

An invitation from the American Dental Society of Europe asking the members of the association to attend their next annual meeting was referred to the secretary for an appropriate reply.

An amendment to the constitution was offered, which goes over for action next year, as follows:

Amend Section 2, Article III, to read: "Any permanent member losing his membership in his local dental society from any cause shall, from that date, cease to be a member of this association."

A committee on necrology was appointed with Dr. J. Taft, Cincinnati, as chairman, which reported a minute of the deaths of the following members: Drs. Stoddard Driggs, of Lexington, Ky.; J. H. Devore, of Corry, Pa.; William Dutch, of San Francisco, and C. P. Fitch, of New York. The report was adopted, and the committee instructed to include the names of any other members deceased since the last meeting, and report to the publication committee.

Dr. C. R. Butler, Cleveland, offered the following resolution:

Resolved, That it is unprofessional to use on cards anything but name, title, and address.

Dr. William Conrad, St. Louis, said that he had requested Dr. Butler to bring in the resolution, because at the last meeting of the Missouri State Dental Association considerable time was consumed in discussing the question. Some gentlemen had on their cards "Gas Given," and the association refused to admit any one who so used the words.

The resolution was adopted.

A committee consisting of Drs. J. Taft, W. C. Barrett, and E. T. Darby was appointed to procure a list of graduates and licensees

practicing dentistry in the United States, the committee being authorized to draw on the treasurer for a sum not exceeding $50.

Saratoga Springs was selected as the place for the next meeting.

The election of officers resulted as follows: C. R. Butler, Cleveland, O., president; A. W. Harlan, Chicago, first vice-president; Samuel A. White, Savannah, Ga., second vice-president; Fred. A. Levy, Orange, N. J., corresponding secretary; George H. Cushing, Chicago, recording secretary; A. H. Fuller, St. Louis, treasurer; E. T. Darby, Philadelphia, George W. McElhaney, Columbus, Ga., J. N. Crouse, Chicago, and Frank Abbott, New York, executive committee, the fourth member being elected to the vacancy caused by the resignation of Dr. Harlan.

The newly-elected president was installed, and after briefly returning thanks, appointed Drs. Darby and Harlan members of the publication committee.

The usual resolutions of thanks were adopted, and the association adjourned to meet in Saratoga Springs on the first Tuesday in August, 1889.

SOUTHERN DENTAL ASSOCIATION.

The twentieth annual session of the Southern Dental Association was held in the lecture-room of the Female High School, Louisville, Ky., commencing Tuesday, August 28, 1888. The papers prepared for the association were read and discussed in joint session with the American Dental Association, regular routine business only being transacted as a separate body. President B. H. Catching in the chair.

The death of Dr. J. H. Prewitt, of Madisonville, Ky., first vice-president of the association, was announced, and Drs. John C. Storey, D. R. Stubblefield, and G. F. S. Wright were appointed a committee to prepare a suitable memorial. Drs. Henry W. Morgan, W. N. Morrison, and T. T. Moore were appointed to prepare a similar minute of the death of Dr. J. S. Franklin, of Nashville.

The committees subsequently reported, and the reports were adopted.

A communication from the American Dental Society of Europe was read, inviting the members to attend the next annual meeting of that society. The secretary was instructed to return the thanks of the association and express a friendly greeting.

The amendment to the constitution offered by Dr. McElhaney last year to provide for the election of an executive committee of six members, two for three years, two for two years, and two for one year, and thereafter annually two members to serve for three years, was taken up and adopted.

Drs. H. J. McKellops, St. Louis, and J. Y. Crawford, Nashville,

offered a resolution that a committee of three be appointed to memorialize Congress requesting the repeal of all duties on dental goods, appliances, and instruments. Adopted.

On motion of Dr. C. G. Edwards, Louisville, the president was authorized to appoint a committee of three in each State to correspond with members of the dental profession and place before them the matter of raising funds to fight the International Tooth Crown Company's patents, the amounts so collected to be placed in the hands of the treasurer of the Southern Dental Association.

The election of officers resulted as follows: J. Y. Crawford, Nashville, president; John C. Storey, Dallas, Texas, first vice-president; W. N. Morrison, St. Louis, second vice-president; John S. Thompson, Atlanta, Ga., third vice-president; D. R. Stubblefield, Nashville, corresponding secretary; M. C. Marshall, Little Rock, Ark., recording secretary; H. A. Lowrance, Athens, Ga., treasurer. For members of the executive committee, Drs. A. A. Dyer, Galveston, and W. R. Clifton, Waco, Texas, were elected for one year; G. S. Staples, of Sherman, Texas, and B. H. Catching, Atlanta, for two years, and H. E. Beach, of Clarksville, Tenn., and H. J. McKellops, of St. Louis, for three years.

The newly-elected president was introduced by the retiring president, and briefly returned his thanks.

After the usual votes of thanks, including the ordering of a committee consisting of Drs. F. Peabody, W. C. Wardlaw, and S. A. White to procure a gavel suitably inscribed for the retiring president, the association adjourned to meet in Galveston, Texas, on the third Tuesday in August, 1889.

JOINT MEETING OF THE AMERICAN DENTAL ASSOCIATION AND SOUTHERN DENTAL ASSOCIATION.

Two hundred and seventy-three names were entered on the register of visitors to the joint meeting of the American Dental Association and the Southern Dental Association, held at Louisville, Ky., commencing Tuesday morning, August 28, 1888. The actual attendance was considerably larger, however, as a goodly proportion of those who took part in the deliberations failed to register. The meeting, in point of interest, was an excellent one. Many papers were read, of a character above the average.

The deliberations of the joint session were held in the chapel of the Female High School, President B. H. Catching, of the Southern Association, presiding in the morning, and President Frank Abbott, of the American Association, in the evening.

First Day—*Morning Session.*

The session was devoted to the formal opening of the meeting. Dr. C. G. Edwards, of Louisville, chairman of the executive committee, occupied the chair and called the meeting to order at 11 o'clock.

After prayer by Rev. Mr. Moore, Mayor Charles D. Jacob was introduced, and, in a felicitous though brief speech, welcomed the members of the dental profession to Louisville.

Dr. A. O. Rawls, of Lexington, Ky., of the Kentucky State Dental Association, extended a hearty welcome on behalf of his association and his State.

Responses were made by Dr. E. T. Darby, of Philadelphia, for the members of the American Dental Association, and by Dr. J. Y. Crawford, of Nashville, who spoke for the Southern Dental Association; and the session was then closed, after a few brief announcements from the chair, with the benediction, pronounced by the Rev. Moore.

Evening Session.

The meeting was called to order by Dr. Catching, who introduced Dr. Abbott, president of the American Dental Association.

Dr. Abbott read his address, inviting attention to a brief review of the last ten years of scientific work in the specialty of dentistry in one particular line of study. "The superiority of the system of dentistry as practiced in this country," he said, "is so manifest and so universally conceded, that even comment is uncalled for." The unparalleled development of this specialty in medicine is forcibly illustrated by the number and generally good quality of the schools devoted to the education of young men for its practice, and by the increase of the literature upon dental and oral science, the richness of practical devices, useful inventions, and improvements in methods of treatment. In Europe, except England and France, there are few schools devoted exclusively to instruction in this branch of the healing art. The difficulty in establishing dental schools on the European continent seems to be their dependence upon the universities on the one hand, and the meddling of the governments on the other. A thorough preliminary education is required before entrance to the university in Germany and Austria, and then five years of hard work must be given to the study of medicine before the degree of M.D. can be taken. Until recently these preliminary steps were necessary before a specialty could be taken up. The very important branch of dental prosthesis is even now in the hands of technically skilled but otherwise uneducated persons. The dentist proper, who has a right to operate on the natural teeth, relies upon the dental technician, who is forbidden to practice "over the chair," for pros-

thetic work. The government sharply superintends the movements of these dental mechanics, and woe to them if caught extracting a tooth even. With us the utmost liberality prevails in the choice of a profession or trade. To enter a dental school the candidate must be able to satisfactorily pass an examination prescribed by those who are supposed to know what is needed. To make a successful practitioner of dentistry, a good general education, together with a good deal of brains, a vast amount of manual skill, and sound judgment, are essential. We insist upon a good knowledge of anatomy, physiology, chemistry, pathology, and therapeutics; and we lay particular stress upon the all-important knowledge which enables the student to do independent work, both surgical and prosthetic, and do it well. The present or coming generation of dentists is nearly all college-educated, and so strong has become the conviction of the necessity of a thorough education for proper dental practice that there are stringent laws on the subject in most of the States.

Dentistry has shared in the profits accruing from the inventive genius of Americans, but the zeal for improvement has caused no little harm in many cases, more particularly where the removal of certain teeth or the filing or grinding away of portions of teeth to make room has been practiced. Under some circumstances it is undoubtedly good practice, but these are exceptional cases. Within the past eighteen months Dr. Younger has brought prominently before the profession the operation of implantation, but so far its permanency has not been accomplished. Absorption of the roots takes place in from three or four months to two years, and the implanted tooth is lost. It is to be hoped that the difficulties will soon be overcome. The fear has been expressed that so much meddling of the American dentists with the teeth of the people would finally lead to the complete destruction of the dentures of coming generations, but the reverse seems to be the fact, and the writer ventured the assertion that nowhere else in the world can so many well-cared-for and perfect dentures be found, in the mouths of the same class of people, as in America, a result brought about by the education of the people by educated dentists.

While the practical work of the specialty of dentistry has reached such a degree of perfection, the scientific or theoretical part has by no means been neglected. [In considering this branch of his subject Dr. Abbott reviewed the work and conclusions of Drs. Heitzmann, Bödecker, and himself, based on the bioplasson theory of Heitzmann.] The fact that operations on the teeth are extremely painful will suffice to prove to an unbiased mind that the hard tissues of the tooth, particularly the dentine, are endowed with life. The question is, where is this life located? Ten years ago, Dr. C. F.

W. Bödecker succeeded in demonstrating that the "Tomes fibers" are formations of living matter. The conical offshoots, emanating from the periphery of the dentinal fibers, were shown to penetrate light spaces in the basis-substance, which form a net-like arrangement throughout the dentine. In this view the whole basis-substance, formerly considered inert, is proved to be traversed by living matter. This is, of course, in pronounced opposition to the cell theory. Many botanists, however, both German and English, have of late conclusively proved that the so-called cells of plants are by no means individuals, but are all interconnected by offshoots traversing the basis-substance,—known in plants as cellulose, cement-substance, etc.,—thus establishing an uninterrupted continuity of living matter, the same as Heitzmann claims exists in animals.

Following Bödecker's demonstration it was shown that in the process of caries of dentine in a living tooth a reaction takes place, known as inflammatory, to which view the writer still holds, after having repeatedly reviewed the ground then gone over. The formation of secondary dentine was elucidated by Bödecker, as also the process of primary inflammation in dentine called by him ebonitis, in which there is a reduction of perfected dentine to its embryonal condition, from which a new tissue, osteo-dentine, arises.

For many years it has been a moot question whether enamel is a mere deposition of lime-salts or a tissue supplied with life and nutrition. Bödecker demonstrated in 1878 that there are interstices between the enamel-prisms holding extremely delicate fibrils of living matter sending offshoots into the prisms themselves, thus causing the transverse striations. The square fields caused by these striations were shown to hold a delicate light reticulum, also supposed to contain living matter. The writer is convinced, after ten years' study, that enamel is possessed of living tissue,—a conviction, he is sorry to say, shared by but few microscopists. The pathology of enamel also furnishes strong proofs of its life. He has demonstrated that in caries a partial reduction of the enamel to its embryonal condition occurs, and that pigmentation (incomplete calcification) shows a markedly distinct reticulum; and that stratification, anomalies in the course of the prisms, excess of club-shaped spaces, etc., are the result of faulty development, and as such prove the life of the tissue.

Bödecker found cementum to be identical with bone-tissue in every respect. In the writer's own observations the evidence is overwhelming that, no matter how anomalous the shape, the cementum is still filled with living matter, which is supposed to be continuous with that of the pericementum on the one hand, and of the dentine on the other; so that a pulpless tooth may be retained

in a useful condition almost indefinitely, provided it has an antagonist.

The development of the teeth has been carefully studied during the past eight years by Heitzmann and Bödecker. Their researches give evidence that the epithelial tissue of the cord is transformed into the myxomatous of the enamel-organ, which, as such, has ceased to be epithelial and is stored-up material for the formation of the future enamel. This myxomatous tissue is the matrix of ameloblasts, which break up into rows of medullary corpuscles, and these, after being infiltrated with lime-salts, build up the substance of the enamel itself. In the development of dentine the same transformation takes place: first, the medullary elements of the papilla into odontoblasts, these again being transformed into medullary tissue, which as such receives the lime-salts and thus becomes dentine. Both enamel and dentine are the direct product of embryonal elements, the same as are all other tissues of the animal organism, the ameloblasts and odontoblasts being merely provisional formations.

The paper, after mentioning other workers in this line, Andrews, Black, Sudduth, Williams, and Stowell, as deserving of great credit for what they have done, closed with the hope that the time was not far distant when the researches made in this country will meet with the approval of at least a majority of microscopists the world over.

Dr. Abbott then introduced Dr. B. H. Catching, president of the Southern Dental Association, who proceeded to read his address, which was mainly devoted to a consideration of the question, "Is the Average Dentist of To-Day a Specialist in Medicine?" An abstract of Dr. Catching's paper follows:

The question is not to determine the relation of dentistry to medicine, which it did not require a formal declaration on the part of the medical profession to establish. The very objects and purposes of dentistry as practiced by those competent denote this, but, unfortunately, the number of those who practice it as a specialty of medicine is small as compared with those who follow it as a trade. He who builds a bridge and welds gold, and feels that with a bottle of creasote or carbolic acid he has reached the highest professional standard, has no conception of the possibilities of his calling. Our usefulness is not less but greater than that of some specialties now honorably listed on the professional calendar, and the writer came to persuade those who feel the responsibility of a specialty in medicine resting upon them. Can it be claimed that dentistry is a specialty in medicine, and the necessity of a medical education to practice it be denied? None have risen to distinction possessing only the knowledge necessary for the degree D.D.S., but many have risen who, possessing

the degree, realized its limited sphere, and reached out for a thorough medical education, and these stand to-day as leaders in the profession, and upon such must rest the honor of advance in dental science. No better argument for the necessity of a medical education is needed than to point to the medical degrees of our college presidents and professors. The M.D. is the only degree which conveys the full privilege of medicine and surgery, the only degree that can protect the dentist even in serious results of surgical operations. The law will not find him blameless who essays operations from which evil results follow, without this degree. The demand is for higher qualifications, a broader curriculum, and an extension of time. The place to guard the sacred precincts of professional life should be at the college doors, instead of at State borders. The rapidly multiplying numbers of schools induce a scramble for matriculates more befitting a stock exchange than an institution of learning. They are not created because of necessity, and often the solution is found in the domineering of the trade over the professional spirit. With the tradesmen more colleges means more students, more students more trade. The relation of dentistry to medicine is that of surgery. The general surgeon, the gynecologist, the ophthalmologist, the otologist, the dermatologist, the laryngologist, is master of the medical science as it is taught in the medical schools; but the dental surgeon is not master of the medical science, because he is not taught in the medical schools. Now that the relationship has been defined by the highest medical tribunal in the land, we should set about to qualify for an intimate existence. Extension of time under the present system would not accomplish what we need; we must adopt the system which will educate us in the science of medicine and perfect us in the art of dentistry; convert the infirmaries of our dental schools into the highest and most comprehensive oral infirmaries, where the masters should teach the whole art. The qualification for admission to these infirmaries should be the degree of Doctor of Medicine, conferred by a reputable medical college. The transition would be easy. It would lessen the number of infirmaries, but it would elevate the standard of education. The need for post-graduate schools under the present system is so great that their creation cannot much longer be deferred, and their establishment would mean the downfall of the present system.

Dr. James Truman, Philadelphia, disliked to appear in antagonism to a paper so ably written as the last, but there are some points in it which require notice. He does not agree with the idea of the writer of the paper that it is absolutely essential that dentists

should have the degree M.D., and in his opinion they can practice as satisfactorily to themselves and to their patients under the separate degree. Nor does he believe, after a quarter of a century's experience in teaching dentistry, that it is possible to make good dentists out of medical men, as a rule. It is an error to begin the education at the top; we must begin at the bottom. If we commence at the top, the students never go down the ladder well. His experience in trying to make dentists out of medical men is that their heads are so full of general principles that they don't come down to the details so necessary in the practice of dentistry. It would be well if all dentists could get the M.D. after acquiring the practical education and training. Another idea put forth in the paper that should not go forth without question is that the D.D.S. will not protect the dentist if anything goes wrong after an operation. He knows of no such law, and of no place where the degree is recognized that the law will not sustain the dentist in operations on the mouth. He had been a witness in a number of cases, and in every one the dentist was sustained in the legitimate practice of his calling.

Dr. N. J. Roberts, Waukeegan, Ill., in a colloquy with Dr. Truman, maintained that the law would not sustain the dentist in any operation but the extraction of a tooth; that as now educated the dentist could not follow out the treatment of his cases: that is, if it became necessary to cut out a portion of the bone, and evil resulted, the dentist would be held responsible. Two or three cases of the kind had occurred in Illinois, which were to be tested.

Dr. George H. Cushing, Chicago, thought the law hadn't much to do with it. If the dentist should make a mistake which resulted seriously, he would be held responsible the same as a medical man would.

Dr. W. W. H. Thackston, Farmville, Va., in reply to Dr. Roberts, said that some of the most brilliant operations in surgery had been performed by dentists who had only the degree of D.D.S., and he instanced the somewhat celebrated case of the late Dr. S. P. Hullihen, of Wheeling, W. Va., whose operation was sustained by the medical profession, by the law, and by the parties in interest. This is only one of a long line of brilliant operations by dentists.

Dr. J. J. R. Patrick, Belleville, Ill., takes it for granted that law is common sense. If a man is guilty of malpractice, it makes no difference how many diplomas he may possess, the line will be drawn by the lawyers from the testimony of experts when the case is in court. A man in the general practice of medicine is not protected in malpractice.

Dr. W. H. Morgan, Nashville, would take issue with two points in the address of Dr. Catching. The first is the assumption that the

M.D. is higher than the D.D.S. He questions the idea that the medical students are more thoroughly taught than are the dental students. Take, for instance, the courses in the medical schools. They generally require attendance on two courses of five months each, with sometimes an additional year. Among the dental schools there is not one in reputable standing that does not give at least two years of five months each, and their students are just as earnest in their desire to acquire knowledge as are those of the medical schools. The other idea with which he would take issue is the "trade" idea. He would ask, is not mechanics a science? Is it not a more exact science than any taught in the medical schools except chemistry? Is not that a more exact science which enables a man to calculate the height and contents of a column than that which directs a man to give calomel to act on the liver but don't tell him how it acts? Medical practice to-day is largely based on theories drawn from unascertained facts. They are plausible, but have no sure foundation.

Dr. J. D. Patterson, Kansas City, thought that in cases of dental jurisprudence if the dentist can prove that he has exercised due care and skill, the law will not hold him guilty of malpractice; while if he cannot so prove, the law will hold him. He is sorry to hear one who is professedly in favor of higher education for dentists oppose the increase in the number of schools. It is a mistake to say that they will recruit their students from the lower strata. The whole tendency among the schools, new as well as old, is toward a higher standard and higher qualifications for entrance.

Dr. Truman W. Brophy, Chicago. As to where the line shall be drawn between the field of the dentist and that of the surgeon, any man who is educated for a special line and has received a certificate of qualification in that line has a right to follow it within its legitimate bounds. If a man is educated as a dentist he is prepared to follow up the treatment of any operation he performs as a dentist. He is permitted to practice anything that was taught him at college, and if he makes a mistake he will be amenable to the law for it. A few years ago the speaker had held precisely the same view as to the taking of the medical degree as a preliminary to a dental education that had been presented by the writer of the paper under discussion; but experience under the most favorable circumstances for the carrying out of that idea had completely changed his views. The school with which he is connected as originally established required as a prerequisite to entering its classes for the pursuit of dental studies the possession of the medical degree. The experiment was an absolute failure, and he is now satisfied that such a system of education for dentists is impracticable and cannot be carried out. If it is attempted the dental profession is not elevated, but rather

carried downward. We cannot take men with the cast of mind which their medical studies give them, and change them into dentists with as good results as we can achieve with the novice in three years. The student must have dental ideas from the beginning. Put him through his dental studies first; then if he wants more medicine than he has acquired, put him through the medical college.

Dr. J. Y. Crawford, Nashville, thought that some of the things which had been said to-night were not such as the speakers should be proud of. The idea that the acquirement of an education in medicine would disqualify a man for the practice of any branch of medicine seemed to him monstrous,—the most dangerous doctrine upon the subject of the education of dentists in a body whose object is professedly the advancement of dental education that has been promulgated for a quarter of a century. The saddest day in its results to dentistry will be when we make the declaration that we are no part of medicine. He means rational medicine and its rational study when he asserts that it is incompatible with common sense that the acquirement of a medical education should disqualify the one who possesses it from the discussion of the means for the prosecution of any department of medicine. With regard to the statement by Dr. Catching as to the liability of the dentist in case of malpractice, he is not satisfied that the question how far the dentist may go in the treatment of surgical cases has been adjudicated, but he apprehends that expert testimony before the courts, interpreted by the lawyers, would settle it on lines of justice. It pained him that the idea had been promulgated here that dentistry is not in the highest sense a specialty of medicine in all of its bearings. We had better not go too far in that direction.

Dr. A. Wilkes Smith, Louisville, in view of the fact that two years ago the American Medical Association had recognized the dentists by adopting a resolution that those who had taken the degree D.D.S. could become members of that body, would ask what had occurred to cause so much feeling on the subject of the relations of the two. Have they snubbed us? Have they retired from the position they then occupied? In his opinion, a medical man can make a good dentist, and a dentist can make a good medical man. We ought to reconcile these old matters of forty or fifty years ago.

Dr. Louis Ottofy, Chicago. We are making our own history. Look at the assemblage here, and then turn to the late meeting at Cincinnati. We are hurting our own cause by such utterances as have been made on this floor. One of the dental journals closed a recent article pleading for higher education for dentists with the warning statement that dentists who practice implantation without other qualification than that conferred by the D.D.S. lay themselves open

to prosecution in every case, and their position would not be agreeable if untoward results should occur. He has made some effort to find out how far dentists may go in the treatment of cases without violating the law, and as a result he learns that in Ohio, Pennsylvania, and New York the laws permit a dentist to perform any operation within the domain of dental surgery.

Dr. C. S. Stockton, Newark, N. J., thought safe middle ground might be taken on this question. Dr. Truman said that it was preposterous to attempt to educate a man downward. The speaker claims that a shoemaker, for instance, will be a better shoemaker if he is a graduate of a college. It does not make a man any less a man because his head has been filled with ideas that he had not before he attended college. The dentist should know not only the anatomy of the cranium, but also of the entire body. The proper way would seem to be to first educate him in the work he is to do,—first teach him to make a set of teeth and put in fillings, and then let him take the post-graduate course in the medical college.

Dr. C. N. Peirce, Philadelphia. Herbert Spencer has said that the secret of education is to study what one most wants to know, and that is the idea which Dr. Truman has in mind. The education of the medical man spreads over too much ground for the purposes of the dentist. The man who takes in the whole field of medicine is not so likely to be a fine operator in dentistry as one who applies himself to the details of his specialty. Relative to the status of dentists in the courts he would say that only last week he witnessed an operation performed by a dentist in a hospital in the presence of four physicians. The operation was for the removal of an epulis. Dr. Peirce then related a number of instances in which dental practitioners had been upheld by the courts in the performance of operations within the limits of dental surgery. In one of these the court ruled that the dentist was educated to do these operations, and there could be no question that he was fully authorized to perform them.

Dr. W. Xavier Sudduth, Philadelphia, thought that, as regards the legal aspect of the dentist's right to follow up the treatment of his cases, there is no question that it depends on the ability of the operator. Physicians in their studies have every means afforded them to learn the different operations, yet cases where suits for malpractice are brought against them are constantly occurring. If a dentist performs an operation from which serious consequences arise, he will be mulcted if he cannot show that he has sufficient knowledge and skill to perform it properly. It is not a question of degrees, but of qualifications. If a man held only one degree and performed operations not taught in the school which he attended,

the jury would be prejudiced against him. The dentist should be a dentist first, last, and all the time. He should commence his studies in the laboratory, and gradually add whatever may be desirable to complete his qualifications. If he goes into the medical school it should be after he has acquired the dental specialty. The speaker's observation taught him that dentally educated medical men are generally failures, and that medically educated dentists are better men in dentistry.

Dr. G. F. S. Wright, Columbia, S. C. The most important part about a college education is that it teaches men how to learn. There are few schools which pretend to fit their students to cope with every condition they may meet in practice. If a man stops where the schools leave him, he is a failure.

Dr. R. R. Freeman, Nashville, said that in his part of the country medico-legal questions involved in alleged cases of malpractice would rest with the judge and the jury. He does not know who gave the medical colleges which grant the M.D. degree a patent right to say who shall and who shall not practice. As to dentistry being a specialty of medicine, where was the man who only a few years ago dared call himself a specialist in medicine? Whoever had the temerity to do so was branded as a "quack." There are men now teaching medicine in the medical colleges who don't know how many teeth there are in the permanent set, or the order of development or the time when the various teeth of either set are developed. Are these the men who are to teach dentists? The fact is, dentistry as a separate profession came of necessity. The entire healing art is not covered by the M.D. They cannot pretend to teach it all. Dentistry is recognized as being as distinct a specialty as any other in the land. It is established, and by the works of its followers. Resolutions may be passed defining its relation to medicine, but they won't change our status. We have made our position, and what we now realize is that our abilities are not equal to our needs, and that we want more colleges.

Dr. George J. Friedrichs, New Orleans. The medical profession may recognize dentists as practicing a specialty in medicine, but the general public will never know them but as dentists. A great deal of stress has been laid on education,—on the teaching of the art of the dentist. The main point brought out in the debates on this question would seem to be that if a young man receives a dental education, he enters upon the practice of dentistry as an accomplished artist in his art. This is not by any means the case. The great distinction between the M.D. and the D.D.S. is that the doctor of medicine can legally practice dentistry if he so elects, but the dental surgeon cannot practice medicine. The public would not receive

him, and it is a question whether he would not be hauled up by the boards as a quack; but where is the dental board that can prevent a medical man from practicing dentistry?

Dr. F. Peabody, Louisville, never knew a dentist who knew too much about medicine. We have to practice medicine constantly in dental surgery. Where is the gentleman who has not given medicine in treatment of his cases? Is there a dentist in the South who has not given quinia for the cure of malarial toothache, and without the use of instruments? Dr. N. S. Davis, the president of the late International Medical Congress, has said that the specialty of dentistry should stand on the same plane as other specialties of medicine. The oculist, the aurist, and other specialists in medicine first lay the foundation by taking the degree in medicine and then take up their special studies. So far the dentist has not, as a rule, prepared himself for practice in this way. He believes that several of the State laws on the subject prevent physicians from practicing dentistry. So far as a medical education for dentists is concerned, we certainly cannot do our work any less well for having more knowledge. In preparing for dental practice we advance from the medical education a point higher up into dental art. Are not all the underlying sciences of medicine taught in the dental schools? What is the objection to a man's acquiring more information than he absolutely needs in every-day practice? One need not be a poorer dentist because he also happens to be a good astronomer. For one, the speaker could not understand how it could be argued successfully that the possession of a medical education must unfit a dentist for the practice of his specialty.

Dr. L. D. Carpenter, Atlanta, Ga., is of the opinion there are few laws on the subject which do not prohibit medical men from practicing dentistry.

Dr. Catching, in closing the discussion, said that his views had been so pounded at by the college professors on all sides that it would be a hard matter to answer all the points that have been made. As to the idea suggested by Prof. Truman, that the medical education might be superadded to the dental training, he does not care at which end the medical education is taken, so that it *is* taken. As to the serious results which might ensue in the case of dentists who perform operations from which untoward consequences follow, there can be no question. If a dentist should administer chloroform and the patient should die, what is the result? A physician can give a certificate of death in such cases, but a dentist cannot. As to Prof. Morgan's illustration of the so-called action of calomel on the liver, the teachings of the latest researches on the subject are that calomel does not act on the liver at all. Prof. Brophy twists all around

the subject, but he finally winds up with the admission that a medical education is a good thing for a dentist. As to the real value of a medical education to a dentist, the true specialist is a man who practices general medicine, and then out of his experience selects the specialty best suited to his capacity and desires, and, having made his selection, follows it. He wants to see the time when dentists will be recognized by the general profession and qualified to be called in consultation and to advise with the family physician, which is impossible under the present system of education.

On motion of Dr. Cushing, the dentists of the city and vicinity were invited to take part in the discussions whether they were members or not.

Adjourned to 9 o'clock A.M. to-morrow.

SECOND DAY—*Morning Session.*

The joint meeting was called to order at the appointed hour by President Catching.

A communication from the Commercial Club, of Louisville, inviting those in attendance on the joint session to an excursion on the river, was accepted.

The Committee on Operative Dentistry was called, and Dr. E. T. Darby read the report.

The report announced three papers: "Dental Inlaying with Porcelain," by Dr. W. Storer How, Philadelphia; "The Rationale of the Construction of Artificial Crowns for the Roots of Natural Teeth," by Dr. J. J. R. Patrick, Belleville, Ill.; and on the conductivity of various filling-materials, by Dr. C. Edmund Kells, Jr., New Orleans; and also stated that Dr. T. L. Gilmer, Quincy, Ill., would describe a method of making crowns which he had devised.

The report continued that the subjects which had attracted the most attention from the profession during the year were the immediate filling of root-canals, the general treatment of pulpless teeth, the transplantation and implantation of teeth, and the use of copper amalgams. While the introduction of certain germicides has greatly lessened the dangers of septic conditions in pulpless teeth, the reports from some writers have been so startling that it would seem wise to inquire carefully into the experiences of the profession at large. The apparent success which has attended implantation operations makes the subject eminently worthy of consideration. Dr. E. C. Kirk, of Philadelphia, reports 30 implantations, with 2 failures; Dr. S. G. Perry, of New York, 27 cases, with 1 failure; Dr. G. L. Curtis, of Syracuse, N. Y., 32 cases, with 1 failure. Others have reported smaller numbers of cases without a single failure.

That teeth implanted in artificial sockets do present every appearance of health, and subserve every purpose in like manner with teeth developed after the natural process, there can be no doubt. Time alone can solve the problem as to the advisability of the operation. During the past few years American dentists have been experimenting with an amalgam of copper and mercury, which, as is well known, has been held in high esteem by the English and European dentists. The high indorsements which it has received would seem to warrant the statement that copper amalgam has made its way into American practice, and bids fair to retain its position as one of the best filling-materials.

Dr. W. Storer How read his paper, which was entitled "Dental Inlaying with Porcelain." [See page 719 of the current number of the Dental Cosmos.]

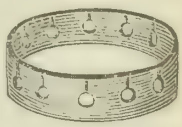
Dr. J. J. R. Patrick read his paper on "The Rationale of the Construction of Artificial Crowns for the Roots of Natural Teeth." [See page 706, current issue of the Dental Cosmos.]

Dr. C. Edmund Kells, Jr., New Orleans, read a brief paper on the conductivity of various materials used in filling teeth. An abstract follows:

Dr. Kells's use of oxyphosphate and oxychloride of zinc had not led him to believe in their non-conducting properties, and he had therefore prepared an apparatus by which he had been able to demonstrate his conclusions in the most convincing manner. The apparatus consists principally of an electric battery, a bell, and a thermostat, which latter consists of a zinc disk, slightly concave, held rigidly at its edges in a hard rubber base, through the back of which is fitted a finely threaded screw with a lever for delicate adjustment attached to the head. Placing the disk and the screw in the circuit with the battery and bell and turning the screw down till it impinges upon the disk, closes the circuit and rings the bell. Turning the screw back a portion of a turn breaks the circuit and the ringing ceases. If heat be then applied to the disk, as it cannot expand laterally it will bulge in the direction of the screw. Upon withdrawal of the heat the disk contracts to its former position. With the screw so adjusted, a single drop of warm water on the disk at once rings the bell. Cold water will not do it, thus showing that the heat is the cause of the expansion. [Dr. Kells then, by means of the apparatus, showed the difference in heat-conducting properties of enamel and various filling-materials,—gold, tin, copper amalgam, oxyphosphate and oxychloride of zinc, and gutta-percha. The enamel was apparently non-conducting; with the metals and amalgams the response was instantaneous, with the oxyphosphate and oxychloride somewhat slower, and with the gutta-percha still slower.] Dr. Kells's conclu-

sions were: First, that the oxyphosphates and oxychlorides are such comparatively good conductors of heat and cold that they should not be used alone for capping pulps exposed or nearly so. Second, that such pulps should be protected by a layer of gutta-percha, fully one-sixteenth of an inch in thickness where possible. Third, that no filling-material equals the enamel in its kindly protection from thermal influences of its delicate protege within.

Dr. T. L. Gilmer, Quincy, Ill., then described a method of constructing artificial crowns which he had devised for the purpose of placing the advantages of that style of work at the service of those who are unable to pay for the more expensive crowns usually made. He had been casting about for a way of accomplishing this, and had succeeded by combining platinum and Weston's or Watt's metal, which made a very useful crown at a moderate cost. After the root is prepared, a narrow band of platinum is adapted to it. The band is then removed, a number of small holes drilled through it, midway between the upper and lower borders, and a slit cut from each of the holes to the upper border (see illustration), after which the band is replaced on the root and the alternate septa bent slightly outward. A model is then made by placing sufficient modeling composition in the mouth, directing the patient to articulate the teeth, and when the modeling composition has hardened, partly shaping it with a knife, the whole being then removed from the mouth and the carving completed. The model is then invested in plaster as far as the composition extends on the band, a couple of grooves cut to insure proper replacement of the parts, and the investment with plaster completed. When the plaster has set it is warmed, the modeling composition removed thoroughly, and a countersunk pouring-hole an eighth of an inch in diameter is made through the upper portion of the mold, running toward the buccal or palatal portion of the tooth and just within the band. A small vent-hole is also cut in a convenient position. The mold, the two sections of which are secured to each other with binding-wire, is then dried out, and Weston's or Watt's metal poured, slight pressure being made with a conical piece of wood inserted in the pouring-hole while the metal is yet fluid to insure its being forced into all the cuts in the platinum band.



The setting may be done by almost any of the usual methods in such cases.

A crown so made answers quite as well for the posterior teeth as though made of gold.

For the anterior teeth, or for bicuspids when exposed to view, a gold band can be substituted for the platinum, with a porcelain

facing, the modeling composition being used as before to get the lingual face of the tooth. When using a porcelain facing the pins should be bent toward each other to better secure it.

Dr. D. Genese, Baltimore, thought there might be a possibility of splitting the roots in the method of setting the posts for crowns which had been presented by Dr. Patrick.

Dr. Thomas Fillebrown, Portland, Me., while expressing his appreciation of the experiments performed by Dr. Kells, would like to know, further, what is the comparative conductivity of dentine.

Dr. Kells replied that he had so far limited his experiments to the materials shown. He had spent a good deal of time in the preparation of the cells, as, in order that the experiment might be of value, they must all be of the same size, so that the same amount of surface would be exposed, and the walls must be of the same thickness. He would, however, extend the line of experiments to include dentine.

Dr. W. H. Atkinson would be the last to discourage experimentation, but what good were such experiments as these? The very first postulate on which they are founded—that the enamel is the only natural protector of the pulp—is a fallacy. These experiments do not belong here.

Dr. C. N. Peirce was delighted with the exactness of the experiments, but the conclusions drawn from them by their author are not safe, because he ignores the influence of physiological and pathological conditions. If we had to treat only cases in which the pulp is not exposed, these would be to the point; but frequently cases present in which this highly vascular tissue is thoroughly exposed, and we wish to preserve it in a vital condition. Dr. Kells, if the speaker understands him correctly, recommends as a capping gutta-percha, which in the majority of cases is the worst thing that can be applied, because it is merely mechanical, without therapeutic influence. We should make some application which would act remedially. We might cauterize, and thus have a protecting surface which would be practically indestructible, or we might treat antiseptically; but something else besides the mere placing of a gutta-percha covering would be necessary to success.

Dr. Kells was glad Dr. Peirce had raised the point that gutta-percha should not be used as a covering for exposed pulps. He does not so use it. In the paper he said he used a layer of gutta-percha, but that statement is not to be understood as implying that he uses it as capping. These experiments seem to show that those of us who cannot save pulps should destroy them at once. The best capping, if the pulp is not fully exposed, is the natural capping, and he never caps an exposed pulp with gutta-percha, but places a layer of it over the capping, and over this the gold filling.

Dr. J. J. R. Patrick, Belleville, Ill., has often heard pulps discussed, as has every one present. He has heard of beautiful surgical operations on the pulp; that if only a small portion of it could be saved, it should be saved. We have been told to use carbolic acid on the exposed pulp as a preservative measure. If carbolic acid is used, an eschar is formed, and it must go through the healing process of soft tissues. Now, the object of the pulp is to produce dentine. It works from within outward; it cannot begin from the outside and go in. When the pulp is ruptured we are upon the wrong side to produce healing. That must come from within. If a clot is formed, as in the application of carbolic acid, what becomes of it? Has anyone ever shown that there is any organ to absorb it?

Dr. Atkinson was pained to hear doctrines that were exploded thirty years ago reasserted over and over. The speaker has more than once told of a case in which the pulp was exposed and accidentally lacerated during excavation until it bled. He treated the pulp, put over it a gold capping, and exactly one month later, the filling having been lost, he concluded to look at the pulp. He found secondary dentine completely covering it. Another filling was inserted, and that pulp was retained living for many years. That is only one case of many. He would concede that the patient must have good health, but with this any tissue in the body can be reproduced except glandular tissue.

Dr. W. W. Allport, Chicago. Dr. Patrick spoke of the beautiful surgical operations upon the pulp of which he had heard, and insinuated that the reports were not true. The older the speaker grew and the longer he practiced dentistry, the less he regards the importance of the pulp in full-grown teeth. He does not care so much for its preservation in these teeth as he once did. He has performed the operation of amputation, and has done it successfully, the stump continuing to retain its vitality. But because this operation has been done, he does not advocate it. It is not what it is possible to do that is advisable to recommend in all cases. We are too apt to pick up something which seems to promise well, and, because it succeeds once under favorable circumstances, to recommend it for all cases. As to treating exposed pulps, he is convinced that the more we cap pulps and treat them, the less faith we have in the procedure. They can be saved often, under favorable circumstances, in patients with good health, but he hardly believes it worth while to make the attempt in malarial regions.

Dr. R. R. Freeman, Nashville, had noted the applause which greeted Dr. Kells's conclusions from his experiments, and it did not make him feel comfortable over the progress made in the healing art.

He had been taught that pulps, even when exposed and bleeding, could be saved, and he has practiced on that basis for many years. He is ready to say that he does save ninety per cent. of exposed pulps. In one case that he recalled he treated and capped a pulp which, two years afterward, was again exposed; it was again treated and capped; again, three years after the first treatment, it came back with a third exposure, and it was still in perfect condition. As long as these things are demonstrated he wants to plod along in his own way, saving all the pulps he can. If the pulp is going to die it will die more kindly under the attempts to save it.

Dr. John C. Storey, Dallas, Texas, wished to add one little commentary to Dr. Freeman's statement. At the time of the meeting of the Southern Dental Association in Nashville, two years ago, they couldn't find a case of pyorrhea alveolaris in all the city. He is certain locality has something to do with the variable results reported. Dr. Freeman may cap and save pulps in Nashville, but we can't do it in Dallas. The speaker has never saved but one pulp in his life, and that was exposed through awkwardness; and he has but one capping,—arsenic,—which he puts in to-day and takes out to-morrow, and then fills with oxychloride, and they never come back.

Dr. J. E. Cravens, Indianapolis, would say, on the question of pulp-devitalization or destruction, that the pulp, from the time the tooth is completed, labors unceasingly to accomplish its self-destruction, either by filling up its chamber—progressive calcification—or by exostosis—constriction. The more he studies and the more sections he makes, the more firmly he is convinced that the pulp is of very little essential service after the tooth is completed.

Dr. W. H. Morgan, Nashville. The vitality of the dentine depends almost entirely upon the pulp, and if you want to destroy the tooth it is a good way to devitalize the pulp. As far as he understands it, it is always best to preserve the tooth as nearly vital as possible.

Dr. J. Taft, Cincinnati, has been somewhat surprised at some of the positions taken here to-day. What is the result of the devitalization of the pulp? Immediately after the death of the pulp the dentine begins to deteriorate, the deterioration continuing until it ultimately ends in the total destruction of the tooth. The process is, in many instances, totally unlike the ordinary decay, and in teeth of the very best structure their total loss occurs in ten, fifteen, or twenty years, when ordinary decay will not attack them. Nothing of this kind occurs when the pulp is alive. In the speaker's mouth Dr. Atkinson filled a pulpless tooth twenty years ago so effectually that there was no more decay, but three or four years ago the tooth broke down through this insidious disintegration of which he had spoken. The dentine lives because it has a living pulp to nourish

it. The sensitiveness of the dentine is gone the moment the pulp is taken away. The function of the pulp does not cease when the tooth is completed. Is the dentine not becoming more dense all through the life of the pulp, and is not the pulp-chamber becoming smaller and more filled up? Other conditions besides the mere fact of exposure are to be recognized. We cannot treat every exposed pulp on the same line. If the patient is of good constitution it is well to try and save the pulp. There are conditions when it would be folly to attempt the preservation of the pulp. The dentist should have the ability to discriminate the conditions surrounding the case. Among the factors is how long the exposure has existed. In any case arsenious acid should not be used for devitalization. Dentists should study the subject so as to know when to attempt to save and when not to, and in every case where the conditions are at all favorable they should consider it their duty to attempt preservation.

Dr. E. T. Darby, Philadelphia, was aware that the discussion was wandering, but as it had taken so wide a range he wished to say a word in favor of capping the pulp. When he was a student his preceptor found an exposure of the pulp in one of his molars. The pulp was capped with the then new "osteo-dentine,"—oxychloride of zinc,—which preserved it in a vital state at least ten years. The question in cases of exposure is whether it is better to try to preserve the pulp or devitalize it at once. He thinks it wicked to apply arsenic to a recent exposure—say one made in excavating. It ought to be capped and so given a chance for recuperation and salvation. Where there is pulpitis he would not cap that day, nor the next, nor until it seemed favorable. In the first class of exposures —recent—he would save 99 out of 100; in the last 99 out of 100 would be lost. There are cappings and cappings. An exposed pulp may be capped so that it won't know it is capped. He does not suppose that he does this work better than others, but he saves at least 75 per cent., if not 95 per cent. of those he treats. To illustrate the importance of trying to save pulps by capping with oxychloride of zinc, Dr. Darby instanced the case of a naval officer who called with a large cavity on the masticating surface of a molar. In excavating, the pulp was exposed and wounded. It was capped with oxychloride and a large gold filling put upon it. A few years later, after his return from a voyage, the same tooth was found to be carious upon the distal surface and the pulp exposed. It was again capped in the same way and a filling of gold put over it. A few years later the tooth decayed upon its buccal surface and the pulp was exposed. It was again capped, and although twenty years have elapsed since the first capping, and at least ten since the last, it is still a vital tooth. The speaker can show scores of vital teeth thus

treated during the past twenty-five years, and he *knows* they are successful instances of capping with the oxychloride of zinc. He uses oxychloride of zinc for capping. In reply to a question by Dr. Patrick, Dr. Darby stated that he had saved hundreds of pulps that had been bleeding,—not those aching and inflamed.

Dr. J. D. Patterson, Kansas City, thought that one point overlooked by many of the speakers was the patient. There is no question that pulps under favorable circumstances can be saved for months and years, but the question is, in what way can the most comfort be given to the greatest number of patients. His experience is that pulp-extirpation in the majority of cases affords the patient the greatest comfort and the greatest practical use.

Dr. James Truman, Philadelphia, felt like sympathizing with his friend from Texas, as he has never been able to see that it was possible to save 75 per cent. of all the pulps that present for treatment. After a pulp has been exposed for some time there comes a congested condition, when it is almost impossible to save it. When men say they save so many pulps they must prove it. He believes that climatic influences must be considered as well as systemic conditions. Pulps cannot be saved so well in Texas as in high, mountainous regions. The cases where the pulps are saved after exposure are the best of teeth,—the kind whose pulps you can't kill with arsenic, and 75 per cent. of all the teeth we have to treat are of a different character—less resistant, less easily preserved. When pulpitis has set in, the best treatment is to destroy the pulp at once with arsenious acid.

Dr. Storey wished just a word of explanation. In his remarks he referred to pulps actually exposed and bleeding, and not to those with a film of dentine over them.

Adjourned to 7.30 P.M.

(To be continued.)

NATIONAL ASSOCIATION OF DENTAL FACULTIES.

THE fifth annual meeting of the National Association of Dental Faculties was held in the Gentlemen's Parlor of the Galt House, Louisville, Ky., commencing Monday, August 27, 1888.

President A. O. Hunt in the chair.

The following faculties were represented at the sessions:

Baltimore College of Dental Surgery.—M. Whilldin Foster and B. Holly Smith.

Boston Dental College.—J. A. Follett.

Chicago College of Dental Surgery.—Truman W. Brophy, A. W. Harlan, George H. Cushing, J. N. Crouse, and Frank H. Gardner.

Harvard University, Dental Department.—Thomas Fillebrown.

Indiana Dental College.—J. E. Cravens and T. S. Hacker.

State University of Iowa, Dental Department.—A. O. Hunt, L. C. Ingersoll, and I. P. Wilson.

Kansas City Dental College.—J. D. Patterson.

Louisville College of Dentistry.—A. Wilkes Smith and J. Lewis Howe.

University of Michigan, Dental Department.—J. Taft and N. S. Hoff.

School of Dentistry of Meharry Medical Department of Central Tennessee College.—G. W. Hubbard.

Missouri Dental College.—W. H. Eames and A. H. Fuller.

New York College of Dentistry.—Frank Abbott.

Northwestern Dental College.—F. H. B. McDowell and E. J. Perry.

University Dental College (Dental Department of Northwestern University).—J. S. Marshall.

Ohio College of Dental Surgery.—H. A. Smith and Grant Mollyneaux.

Pennsylvania College of Dental Surgery.—C. N. Peirce.

University of Pennsylvania, Dental Department.—James Truman and E. T. Darby.

Philadelphia Dental College.—S. H. Guilford.

Dental Department of Southern Medical College.—L. D. Carpenter.

University of Tennessee, Dental Department.—J. Y. Crawford.

Vanderbilt University, Dental Department.—W. H. Morgan and Henry W. Morgan.

During the sessions the National University, Dental Department, represented by S. J. Cockerille, was admitted to membership.

Applications for membership were also received from Howard University, Dental Department, and from the College of Dentistry, Department of Medicine of the University of Minnesota, and laid over, not having been made sixty days previous to the meeting.

The following resolution, offered by Dr. Foster from the Baltimore College of Dental Surgery, was adopted:

Resolved, That as a matter of courtesy, when a student leaves one college to go to another, the dean of the second college be kindly requested to write to the dean of the first inquiring whether there may be any objections to the transfer; this to be done whether the student has a certificate of examination or not.

Dr. Abbott, from the Committee on Schools, reported that so far the committee has received the details of the intermediate examinations of but two schools. The committee think it well to get the information directed in the resolution adopted last year, so as to be able to have some standard to which all must come.

Dr. Peirce thought the members of the association were more at sea regarding the intermediate examination than as to the final one,

on which they are pretty much a unit. In his school the various members of the faculty are furnished with a list of those entitled to be examined, and each member of the faculty examines each student in his own way and marks the papers. Unless a certain percentage of questions are answered correctly the student cannot pass.

Dr. Howe asked for a complete interpretation of the rule requiring attendance on two full regular courses in separate years before examination for graduation, explaining that his school holds its sessions from January to June. Would it be lawful for a student to take one course with them and then take his second course in the fall in another school, and thus graduate within about a year of his first matriculation?

Dr. Harlan replied that the resolution was adopted expressly to prevent that practice. It was not considered that a student would be fulfilling the requirements by graduating in twelve months.

Dr. Guilford said that at the time the resolution was adopted the Dental Department of the University of California was the only school which held its sessions out of the usual season. The idea of the resolution was to insure that the students should have full clinical practice before graduating. While they might possibly acquire the theory within a year, they could not get sufficient practical work to make them competent dentists.

Dr. Fillebrown would suggest two ways to avoid the difficulty. Either make the lecture courses not less than six or seven months, or require at least two years to be spent in study from the time of matriculation.

The following resolutions were offered on the subject and laid over under the rules till next year:

By Dr. Marshall:

Resolved, That no student shall be permitted to graduate until at least twenty-four months after matriculation.

By Dr. Howe: To substitute for Rule 1 under the heading "Attendance:"

Attendance upon three full regular courses of not less than five months each in separate years shall be required before examination for graduation, and no student shall be graduated until at least twenty-eight months after his first matriculation.

By Dr. Taft, from the Executive Committee:

Resolved, That at least two years of bona fide study and attendance upon two full regular courses of instruction in separate years be required before graduation.

By Mr. McDowell, as a substitute for Dr. Taft's proposition:

Resolved, That after the close of the scholastic year 1889–90 attendance upon three regular winter courses of instruction of not less than six months each, held in separate years, be required of students by colleges in this association before examination for graduation.

Dr. Howe also offered an amendment to Rule 2, under "Attendance," by substituting for "one year's pupilage in a dental office," the words, "one course of lectures in a dental college."

Dr. Howe offered a resolution, which went over under the rules, providing that the recommendation "that three years' study of dentistry, including attendance upon two regular courses of lectures, be required previous to examination for graduation" be made mandatory.

On motion of Dr. Peirce the roll was called to ascertain what colleges had instructed their delegates as to changes in the length and number of sessions which they would support. The representatives of eleven colleges reported that they had been instructed in the matter.

On motion of Mr. McDowell, the roll of the instructed delegates was called for a report as to the character of their instructions, with the following result:

	Time.	Length of Sessions.
Harvard University, Dental Department	3 years.	9 months.
Kansas City Dental College	2 "	6 "
Missouri Dental College	3 "	7 or 9 "
Ohio College of Dental Surgery	2 "	6 "
Pennsylvania College of Dental Surgery	2 "	7 "
University of Michigan, Dental Department	3 "	9 "
University of Pennsylvania, Dental Department	2 "	7 "
Northwestern College of Dental Surgery	3 "	9 "
Louisville College of Dentistry	3 "	5 "
University of Tennessee, Dental Department	2 "	5 "
National University, Dental Department	2 "	6 "

The representatives of the following colleges stated that while they had not been instructed they felt justified, from what they knew of the feeling in their respective faculties, in announcing their positions on the subject as follows:

	Time.	Length of Sessions.
Baltimore College of Dental Surgery	2 years.	7 months.
Indiana Dental College	3 "	6 "
School of Dentistry, Meharry Medical College	3 "	5 "
New York College of Dentistry	2 "	12 "
Dental Department of Southern Medical College	2 "	5 "
Chicago College of Dental Surgery	3 "	6 or 9 "
State University of Iowa, Dental Department	3 "	5 "

The representatives of the following schools were absent or declined to commit their faculties in the absence of specific instructions: Boston Dental College; University of California, Dental

Department; Dental College of Northwestern University; Philadelphia Dental College, and Vanderbilt University, Dental Department.

The following resolution, offered by Dr. Eames, was unanimously adopted:

Resolved, That it is the sense of this meeting that the course of instruction in all colleges belonging to this association should be three years of not less than five months each, and that the delegates shall submit the proposition to their respective faculties and report their action to this association at its next annual meeting, in order that a decision on this question may be had.

Dr. Cushing offered an amendment to the constitution making a majority of the colleges belonging to the association a quorum, instead of two-thirds, as at present. Laid over.

Dr. Foster, from the Baltimore College of Dental Surgery, submitted the following questions for which he asked the consideration of the association:

1. If a student at the end of his junior year fails in his examinations, has he the privileges of a second examination at the beginning of the ensuing term, or before entering the senior class?

2. Are the colleges granting this favor?

3. If the colleges are doing so, is it lawful?

4. If a junior fails to present himself for examination at the end of the junior year, can he be examined at the beginning of the ensuing term?

5. If a student fails to present himself for examination at the end of his junior year, and goes next year to another school, is he permitted an examination by the second school, so that he may pass into the senior class of such school, provided the examination may be satisfactory?

6. If a student having gone to a second college, unexamined as specified, and the dean of the second school has been notified by the dean of the first school that such student had attended one full year's course, and he knows of no good reason to bar him from examination, may such transferred examination be held?

7. What is allowed, and what is the law governing the reception of students who have attended one or more full annual courses at some other college prior to the formation of the National Association of Dental Faculties?

These were referred to a committee, consisting of Drs. Fillebrown, Patterson, and A. Wilkes Smith, which subsequently reported as follows:

1. For intermediate examinations any faculty may examine their students as often as they choose, before the beginning of the next session of their school.

2. This association does not know.

3 and 4. These are practically the same as the first question, and the same answer applies.

5. Comes under the resolution passed at Chicago in 1885: "Colleges of this association will receive into their senior classes only such juniors as present certificates of having passed satisfactory examination in the studies of the first year."

6. The case here stated comes under the same rule as the fifth question.

7. Any student who has attended a course or courses in a reputable college of dentistry, prior to the adoption of the resolution quoted in the reply to the fifth question, shall upon examination be entitled to such advanced standing as his qualifications warrant, in any school to which he may apply, subject to the rules of this association.

The report was adopted.

From the Committee on Text-Books, Dr. Fillebrown reported that the matter of a work on Operative Dentistry is now in the hands of the printers; Dr. Guilford reported that a work on Orthodontia will probably be out by January; and Dr. Hunt stated that the book on Chemistry, prepared under the auspices of the committee, has been published and is now in the hands of the colleges.

Dr. Fillebrown, from the same committee, further moved that Dr. W. Xavier Sudduth be invited to prepare a work on Dental Histology and Embryology, founded on his chapter on dental histology in the "American System of Dentistry," and that it be recommended as a text-book for use in the colleges belonging to this association.

The motion was adopted.

The election of officers for the ensuing year resulted as follows: A. O. Hunt, president; L. D. Carpenter, vice-president; J. E. Cravens, secretary; A. W. Harlan, treasurer; Frank Abbott, J. Taft, and S. H. Guilford, executive committee.

The president appointed as the committee ad interim Drs. Thomas Fillebrown, T. W. Brophy, and J. Y. Crawford.

The Committee on Schools was continued as at present constituted, viz: Drs. Frank Abbott, S. H. Guilford, L. C. Ingersoll, R. B. Winder, and Thomas Fillebrown.

Adjourned to meet at the time and place of the next meeting of the American Dental Association.

NATIONAL ASSOCIATION OF DENTAL EXAMINERS.

The seventh meeting of the National Association of Dental Examiners convened in Parlor B of the Galt House, Louisville, Ky., August 27, 1888.

President Geo. H. Cushing called the meeting to order, and then stating that his term of service as a member of the Illinois State Board having expired, he was necessarily no longer a member of the association, resigned the chair to Dr. T. S. Waters, of Baltimore, the vice-president.

The following State Boards were represented:

Illinois.—C. R. E. Koch, R. N. Lawrance.

Indiana.—P. G. C. Hunt, S. T. Kirk.

Ohio.—J. Taft, H. A. Smith, C. R. Butler.

New Jersey.—Fred. A. Levy.

Georgia.—S. B. Barfield.

Kentucky.—C. V. Rosser, A. O. Rawls.

South Carolina.—G. F. S. Wright.

Maryland.—T. S. Waters.

Mississippi.—W. W. Westmoreland.

Arkansas.—M. C. Marshall, L. G. Roberts.

Wisconsin.—B. G. Maercklein.

The secretary read a communication from the Wisconsin State Board of Dental Examiners, which was referred to a committee consisting of Drs. Taft, Koch, and Barfield. The committee subsequently presented a report, which was adopted, as follows:

Your committee to whom was referred the letter of Dr. Edgar Palmer, secretary of the Wisconsin Board of Examiners, respectfully recommend the discontinuance of the practice of giving permits to practice dentistry to students during the time of their college work or before their graduation.

We also recommend that any applicant for examination and license to practice dentistry between the regular sessions of the respective State Boards may be examined during such interim by one more or members of a State Board as may be designated by said Board, and upon such examination being satisfactory a permit may be issued to the applicant to practice dentistry till the next meeting of the Board and no longer. This examination and permit shall in no case exempt the candidate from an examination by the full Board at the next regular meeting.

Your committee do not believe it advisable to have a uniform list of questions for examination throughout the country. We would recommend, however, that State Boards embrace in their examinations the following branches, and that there be not less than ten questions on each of these branches, viz: Anatomy, Physiology, Pathology, Histology, Hygiene, Materia Medica and Therapeutics, Chemistry, Metallurgy, Operative Dentistry, Prosthetic Dentistry, and Dental Jurisprudence.

We suggest that each State Board formulate its own list of questions, and that this list be changed at least once each year, and that a standard of at least seventy-five per cent. of correct answers be required.

Dr. Barfield offered the following resolution, which was adopted:

Resolved, That the State Boards be requested to furnish the secretary of the National Association of Dental Examining Boards with a certified copy of the laws in force and any amendments in the respective States, and their efficiency.

The resolution adopted in 1885 declaring against the advisability of members of college faculties acting as members of State Boards of Dental Examiners was rescinded by unanimous vote.

A committee was appointed to prepare a list of dental colleges whose diplomas the Association might recommend the various State Associations to receive in lieu of an examination. The report of the

committee was considered, and after being amended was adopted, as follows:

Baltimore College of Dental Surgery, Baltimore. Md.; Boston Dental College, Boston, Mass.; Chicago College of Dental Surgery, Chicago, Ill.; Harvard University, Dental Department, Cambridge, Mass.; Kansas City Dental College, Kansas City, Mo.; Minnesota Hospital, Dental Department, Minneapolis, Minn.; Missouri Dental College, St. Louis, Mo.; New York College of Dentistry, New York City; Ohio College of Dental Surgery, Cincinnati, O.; Pennsylvania College of Dental Surgery, Philadelphia, Pa.; Philadelphia Dental College, Philadelphia, Pa.; St. Paul Medical College, Dental Department, St. Paul, Minn.; University of California, Dental Department, San Francisco, Cal.; University of Iowa, Dental Department, Iowa City, Iowa; University of Michigan, Dental Department, Ann Arbor, Mich.; University of Pennsylvania, Dental Department. Philadelphia, Pa.; Vanderbilt University, Dental Department, Nashville, Tenn.; Northwestern College of Dental Surgery, Chicago, Ill.; Louisville College of Dentistry, Louisville, Ky.; Indiana Dental College, Indianapolis, Ind.; Dental Department of Northwestern University, Chicago, Ill.; Dental Department of Southwestern Medical College, Atlanta, Ga.; Dental Department of University of Tennessee, Nashville, Tenn.; School of Dentistry of Meharry Medical Department of Central Tennessee College, Nashville, Tenn.

A committee consisting of Drs. Taft, Rawls, and Barfield was appointed to co-operate, so far as they can, with the profession in the different States in securing uniformity in the laws regulating the practice of dentistry.

The election of officers for the ensuing year resulted as follows: T. S. Waters, Baltimore, president; S. T. Kirk, Kokomo, Ind., vice-president; Fred. A. Levy, Orange, N. J., secretary-treasurer.

The association adjourned to meet at Saratoga Springs, N. Y., at 9.30 A.M., on the first Tuesday of August, 1889.

VIRGINIA STATE DENTAL ASSOCIATION.

The Virginia State Dental Association held its nineteenth annual meeting at Staunton, Va., August 22 to 24, 1888.

The following officers were elected for the ensuing year: James Johnston, president; D. N. Rust, first vice-president; F. A. Lee, second vice-president; E. P. Beadles, third vice-president; George F. Keesee, recording secretary; J. Hall Moore, corresponding secretary; Charles L. Steel, J. O. Hodgkin, and F. A. Lee, executive committee.

The interest of the occasion was increased by the presence of a

number of guests, among whom were Drs. J. W. White, W. G. A. Bonwill, and E. T. Starr, of Philadelphia, and James H. Harris of Baltimore.

J. HALL MOORE, *Corresponding Secretary*,
104 North Ninth street, Richmond, Va.

FIFTH, SIXTH, SEVENTH, AND EIGHTH DISTRICT DENTAL SOCIETIES OF THE STATE OF NEW YORK.

THE Fifth, Sixth, Seventh, and Eighth District Dental Societies of the State of New York will unite in a joint convention at the Leland Hotel, Syracuse, N. Y., October 24, 25, and 26, 1888.

The meeting will be called to order at 2 o'clock. A cordial invitation to be present is extended to the profession. An extensive programme has been arranged. Prominent dentists from Chicago, Baltimore, Cincinnati, Philadelphia, New York, Boston, Toronto, Newark, Albany, and other cities, have consented to take part. One half-day will be devoted to clinics and demonstrations of improved methods of work and new appliances. All the leading dental manufacturers have arranged to be present with full lines of their goods. Among the social features of the convention will be a banquet for the dentists and a reception for the ladies. It is expected that dentists will bring their wives. A ladies' committee has been appointed.

G. L. CURTIS, *Chairman Business Committee*,
Syracuse, N. Y.

OHIO STATE DENTAL SOCIETY.

THE fourth annual meeting of the Ohio State Dental Society (reorganized) will be held in Lincoln Club Hall, Garfield Place and Race street, Cincinnati, October 16, 17, and 18, 1888.

A cordial invitation is extended to the profession and their families to be present. On account of the Centennial Exposition, railroad rates will be very low. There will be an excellent programme of papers and clinics.

J. R. CALLAHAN, *Secretary*,
Hillsboro, Ohio.

CENTRAL ILLINOIS DENTAL SOCIETY.

THE seventh annual meeting of the Central Illinois Dental Society will be held at Lincoln, October 9 and 10, 1888.

W. A. JOHNSTON, *Secretary*,
No. 430 Main street, Peoria, Ill.

NORTHERN ILLINOIS DENTAL SOCIETY.

THE annual meeting of the Northern Illinois Dental Society will be held at Freeport, on Wednesday and Thursday, October 10 and 11, 1888. An interesting programme is assured.

T. W. BECKWITH, *Secretary*, Sterling, Ill.

EDITORIAL.

THE JOINT ASSOCIATION MEETING.

THE meeting of the American and Southern Dental Associations at Louisville in August was a large one, about three hundred dentists being in attendance, and the proceedings in both the separate and the joint sessions were harmonious and indicative of true professional fraternity. The reading of numerous papers and their discussion fully occupied the joint meetings, and the clinics claimed but an insignificant share of attention. We have therefore no clinical report, but in this number present the first instalment of papers and discussions, and others will follow in successive issues as room can be made for them.

The electrical adjuncts and appliances exhibited by Dr. Knapp and Dr. Kells, of New Orleans, were remarkable and interesting for the ingenuity, enterprise, and skill with which the wonder-working element was made subservient to the needs of the dental operator by means at once novel and effective. Great credit is due these gentlemen for their generous and self-sacrificing endeavors to interest their professional brethren in the practical adaptation of scientifically constructed electrical mechanism to the requirements of the most advanced dental practitioners. Dr. Knapp's exhibit embraced the entire electro-motory appurtenances, illuminating apparatus, and operative accessories of a complete dental office, including devices not thought of by many dentists, while Dr. Kells fully showed the very convenient arrangement of electrical appliances used in his own office.

Dentists whose misfortune it is to be absent from such meetings cannot have their loss made up to them by any amount of descriptive matter. Moral: When possible, always attend the meetings of dental societies.

DENTAL COLLEGE STUDENTS' SOCIETY.

THE students of the New York College of Dentistry in 1887 organized the first dental "Students' Society" of which we have any knowledge as managed and supported solely by students. In

a neatly-printed copy of its constitution and by-laws it is declared that "The objects of this society shall be: to furnish to the students of the New York College of Dentistry opportunities for an exchange of ideas on subjects pertaining to dental science; to foster a habit of independent thought and encourage individual research and invention; to obtain for the common good such dental literature and instruments as, owing to expense or scarcity, would be beyond the reach of the individual student; to offer each year a prize to the member of this society who shall read the best and most original paper at any of the regular meetings of this society; and to promote social feeling among the students."

The president, E. Howard Babcock, in courteously sending us the printed copy referred to, hopes that "the organization of a dental students' society may be deemed worthy of mention in the DENTAL COSMOS." The fact is not only worth recording, but should incite the students of other colleges to similar intelligent and persistent endeavors to perfect themselves, by associative action, in every detail that will help to make them accomplished in all phases of professional attainment. As a means for promoting and maintaining literary qualification such as will make working members in local dental societies, the college students' societies may prove to be of great value, and we hope that every graduate may continue to be a student.

PENNSYLVANIA STATE DENTAL SOCIETY PAPERS.

OWING to a misunderstanding, some of the papers read at the meeting of the Pennsylvania State Dental Society, which by virtue of prior arrangement belonged to the *Independent Practitioner*, were printed in full in the DENTAL COSMOS for September. It is scarcely necessary to say that the DENTAL COSMOS would not willfully violate the courtesies of honorable journalism or the rights of another journal. It does not, except by inadvertence, print papers that are not intended specially for its pages, much less those intended for others.

BIBLIOGRAPHICAL.

A PRACTICAL TREATISE ON ARTIFICIAL CROWN- AND BRIDGE-WORK. By GEORGE EVANS. With 500 illustrations. Octavo, pp. 258 and index. Philadelphia: The S. S. White Dental Manufacturing Co., 1888. Price, cloth, $3.00.

In this volume of 260 pages the author has presented to the dental profession a work which seems to be beyond criticism.

Starting with the preparatory treatment of teeth and roots, in

which are included the various methods of pulp-extirpation and the radical treatment of chronic alveolar abscess, the methods for the making, adjustment, and insertion of all the principal artificial crowns are fully elucidated; after which bridge-work in all its various modifications, together with every detail of manipulation required in its construction and insertion, is most faithfully and clearly treated of. The five concluding chapters are devoted to a consideration of materials, processes, instruments, and appliances used in crown- and bridge-work.

To say that the subject has been well and conscientiously presented is but partial justice, for not only has the whole ground been covered, but, what is of almost equal importance, the author has treated his subject with a clearness and directness which leave nothing to be desired. The impression received upon reading the book is that it is the work of one who is not only practically familiar with his subject, but has in addition that rare quality—the ability to tell clearly what he knows about it.

It is this latter feature as much as anything else that will make it of especial value as a text-book for the student. As a work of reference it has no equal, for in its scope it embraces practically everything of value that has been done in the field of crown- and bridge-work. An attractive feature of the book is the profuse number of wood-cuts, some five hundred in number, which serve to fully illustrate the subject-matter.

The volume should be placed upon the list of standard text-books of the dental colleges, as well as in the hands of every practitioner who desires to be informed upon the elaborate developments in this interesting field of prosthetic dentistry. E. C. K.

A Hand-Book of Dental Pathology. For Students and Practitioners. By Albert N. Blodgett, M.D., late Professor of Pathology and Therapeutics in Boston Dental College. Illustrated. 273 pp. and index. Philadelphia: P. Blakiston, Son & Co., 1888. Price, cloth, $1.75.

The author of this work has attempted to furnish the dental student with a presentation of the more salient facts of dental pathology, and with so much of anatomy and histology as he shall find necessary for the proper understanding of the main subject. A work of this character is much needed from the fact that the mass of pathological data having special reference to the teeth, jaws, and associate parts is nowhere accessible in any single volume, but is scattered throughout a large number of text-books, periodicals, etc. Any attempt, therefore, at a systematic presentation of the subject will undoubtedly be welcome.

While the author has given sufficiently full consideration to pathological conditions of the soft tissues of the mouth as well as of its osseous structures, the pathology of the dental tissues, including that of caries and the dental pulp, has not received the full treatment that the importance of the subject to the dental student demands. The whole subject of the bacterial pathology of the dental tissues is treated in what the Germans term a "step-motherly" manner, which seems to indicate either a lack of familiarity with the recent important advances made in this direction, or a disregard of the accepted etiological relation of certain bacterial forms to dental caries. The work of Miller in this line is ignored, with the exception of a foot-note briefly referring the student to the original publication, which one cannot help thinking has not been fully digested by the writer of the present volume. Certain errors throughout the book give evidence of the truth of the statement in the preface that it "has been prepared during a large amount of professional and other labor." Thus, chapter xiii is devoted entirely to a discussion of the physiological process by which the temporary teeth are removed or shed and their successors erupted, without any reference whatever to pathological deviations from the normal process, yet the caption of the chapter is, "Pathological Conditions Associated with the Second Dentition." The usefulness of the work is seriously handicapped by an obscurity of meaning due to a certain vagueness of expression which occurs in numerous places throughout the book.

The correction of errors is promised in future editions, yet it is much to be regretted that they exist at all in this the pioneer in its particular field.

E. C. K.

Annual of the Universal Medical Sciences: A Yearly Report of the Progress of the General Sanitary Sciences throughout the World. By Charles E. Sajous, M.D., Lecturer on Laryngology and Rhinology in Jefferson Medical College, Philadelphia, etc., and Seventy Associate Editors, assisted by over two hundred corresponding editors, collaborators, and correspondents. Illustrated with chromo-lithographs, engravings, and maps. Vols. I–V, 1888. Philadelphia and London: F. A. Davis, publisher. Price per set, $15.00 and $20.00.

The object of this publication is to present at the end of each year a report of the progress of every branch of medicine during that year in every part of the civilized globe; and further, by investigation of the treatment employed by uncivilized races, to present whatever may be found valuable in remedies or methods. The five volumes comprising the first series, royal octavo, average over 550 pages each,—a total of more than 2700 pages of matter.

The design and scope of the work, extraordinary as they appeared, have nevertheless been admirably sustained, and it gives in compact though comprehensive form the progress of the year in each department of medical science.

On the back of each volume, convenient for ready consultation, is a list of the subjects treated therein, while Volume V contains an elaborate index of diseases, therapeutics, and authors, covering fifty-three pages.

The contributions in this series of special interest to dentists are chapters on "Oral Surgery," by James E. Garretson, M.D.; "Dental Pathology and Therapeutics" and "Dental Embryology and Histology," by W. Xavier Sudduth, M.D., and "Prosthetic Dentistry and Orthodontia," by S. H. Guilford, D.D.S.

THERAPEUTICS: ITS PRINCIPLES AND PRACTICE. By H. C. WOOD, M.D., LL.D., Professor of Materia Medica and Therapeutics, etc., in the University of Pennsylvania. A Work on Medical Agencies, Drugs, and Poisons, with especial reference to the Relations between Physiology and Clinical Medicine. The Seventh Edition of a Treatise on Therapeutics, rearranged, rewritten, and enlarged. Octavo, pp. 882 and index. Philadelphia: J. B. Lippincott Co., 1888. Price, cloth, $6.00.

The author, in his preface to this edition, has so pertinently stated the object and scope of the work that we cannot give a better idea of the volume than by quoting him, as follows:

"Comparatively few persons have a full conception of the rapid progress of therapeutics and of the amount of labor involved in keeping up with this forward movement. Scarcely three years have elapsed since the appearance of the sixth edition, yet the preparation of the present volume has necessitated a careful study by its author of nearly six hundred memoirs. There has been during the last decade a special growth in the appreciation by the medical profession of the value of remedial measures other than the administration of drugs. In preceding editions of this book the demand for this sort of knowledge was in part met by a discussion of the application of the various forces of nature to the relief of human ailments. In the present volume this formerly second portion of the book has been made the first, and its scope has been much extended, so as to take into consideration, besides various miscellaneous remedial measures, massage, metallotherapy, the feeding of the sick, and the dietetic and general treatment of underlying bodily constitutional states or diatheses, such as exhaustion, obesity, and lithiasis. The portion of the work devoted to the study of drugs has been entirely rearranged, in accordance with a new classification,

which it is hoped will commend itself to the reader as natural, and therefore as more simple than the one previously employed. All the new drugs, such as hydrastin, strophanthus, sparteine, adonidine, iodol, ichthyol, paraldehyde, urethan, hypnone, amylene hydrate, methylal, oil of sandal-wood, kawa, extract of malt, papain, antifebrin, salol, bethol, thallin, kairin, acetphenetidin, lanolin, saccharin, sulphuretted hydrogen, etc., have been carefully considered, while many articles upon older drugs, such as cocaine, antifebrin, and caffeine, have been completely rewritten; further, the discussions of even the longest and best-known members of the Materia Medica list have been carefully gone over, and, whenever it has been to the author possible, have been made clearer and more practical. Thus, notwithstanding the constant effort at condensation, nearly two hundred pages of new matter have been added to the book. By the use of italics, or, in some articles, by giving a summary in a distinct paragraph, the attempt has been made to point out to the student what is essential in our knowledge of the physiological action of drugs."

Comparative Studies of Mammalian Blood, with Special Reference to the Microscopical Diagnosis of Blood-Stains in Criminal Cases. By Henry F. Formad, B.M., M.D., Lecturer on Experimental Pathology in the University of Pennsylvania, etc. With 16 Illustrations from Photomicrographs and Drawings. Octavo, 60 pp., cloth. Philadelphia: A. L. Hummel, M.D., publisher, 1888.

This valuable monograph—the result of research in the pathological laboratory of the University of Pennsylvania—formed the substance of a paper read before the College of Physicians of Philadelphia. The author has been subjected to severe and unreasonable criticism because of his testimony as an expert in certain judicial examinations, in which he asserted an ability to determine by the study of blood-corpuscles whether or not they are those of a human being. He presents in this essay his experiments, with the conclusions arrived at from personal studies extending over a number of years. It is a valuable contribution in hematology and in medico-legal science.

Vore Borns Tænder. Under Opvæxten. En Vejledning for Modrene. Af Alfred Bramsen. Pp. 54. Kobenhavn: Gyldendalske Boghandels Forlag (F. Hegel & Son), 1887.

Die Zæhne unserer Kinder Wæhrend des Heranwachsens Ein Ratgeber für Mütter. Von Dr. Alfred Bramsen, in Kopenhagen. Pp. 67. Mit einem Vorwort von Prof. C. Sauer. Berlin: Verlag von August Hirschwald, 1888.

We have received from the author copies in Danish and German of the above neat little illustrated work on "The Teeth of our Children." It is also published in Swedish, and we understand from the author that a French edition will shortly appear, with a preface by Prof. Heide, of L'École Dentaire, in Paris. It is based principally on Dr. J. W. White's book, "The Mouth and the Teeth," most of the illustrations being from that work. It cannot fail to be useful in disseminating information in reference to the importance of the early care of the teeth in all those countries where it may be circulated. Dr. Bramsen is entitled to commendation for his timely efforts in this direction.

OBITUARY.

GEORGE W. KEELY, D.D.S.

Died, at Oxford, Ohio, August 24, 1888, George W. Keely, D.D.S., in the sixty-sixth year of his age.

Dr. Keely's death resulted from injuries received in falling from a window in the third story of the building in which his office was situated, while attempting to mend the wire of a private telephone connecting his office and residence.

Nearly the whole of Dr. Keely's life was spent at Oxford, Ohio, where he was born October 27, 1822. He was educated in the public schools and at Miami University, in Oxford. During his early professional studies he was for a short time with Dr. J. D. White, then a practicing dentist in Hamilton. In 1839 he entered the office of Dr. John Allen, of Cincinnati (now of New York), with whom he spent the two following years. Returning to Oxford in 1841, he established himself in dental practice there, making occasional professional visits to towns in Ohio and Indiana.

After having been in active practice for twelve years, Dr. Keely graduated at the Ohio College of Dental Surgery at Cincinnati in March, 1853. He was one of the organizers of the American Dental Association, and a constant attendant at its annual sessions; was elected its president at Philadelphia in 1876, presided as such at Chicago in 1877, and was its treasurer at the time of his decease. He was also one of the movers in the organization of the Ohio State Dental Society, was once its president, and for ten years its treasurer. He had been either an active or honorary member of the Mississippi Valley Dental Society, the Mad River Valley Dental Society, and of the Kentucky, Indiana, Missouri, Illinois, and Wisconsin State Dental Societies, as also of the New York Odontological Society. He was a trustee of the Ohio College of Dental Surgery for twenty years, being several times president of the board, and for

many years, up to the time of his decease, had delivered lectures at the college on the subject of irregularities of the teeth, which with him was a specialty. He was a frequent contributor to the literature of the profession, and his reports to the American Dental Association on the subject of dental education were of special note.

Dr. Keely was twice married, and had many children, only four of whom are now living; one son, Dr. Charles I. Keely, being in dental practice at Hamilton. Dr. Keely was conspicuous in educational matters at Oxford, was a skillful and intelligent practitioner, social in his nature, and held a warm place in the esteem and confidence of his fellow-citizens.

PERISCOPE.

On Union and Repair of Bone.—The various opinions which have from time to time been held in reference to the union and repair of bone have until recently undergone but little change in their essential elements. The ancients believed * that callus was formed by the extravasation of a gelatinous fluid, which gradually acquired consistence, and united the fragments in the same manner as a cabinet-maker would glue together two pieces of wood. Duhamel † regarded the periosteum as the "organ of ossification," and thought that after a fracture the periosteum of the two fragments first grew together and then swelled, forming a circular elevation around the line of fracture. This thickened membrane he thought was soon converted, first into a gelatinous and then into a cartilaginous substance, in which vessels developed and different points of ossification arose. Haller and Dethleef, after a long series of experiments, disputed this view, and concluded that the callus was formed by the gelatinous juice exuding from the extremities of the fractured bone, especially from the medullary texture, and diffused all about the fracture. John Hunter referred the formation of callus to the organization of the blood which is effused around the ends of the fragments; Fougeroux, to the extravasation of lymph which became organized by inspissation; Larrey, to the action of the vessels which are distributed through the substance of the osseous tissue. Howship, after a number of experiments, concluded that the theory of Hunter was correct, and that the blood which is effused immediately after the occurrence of a fracture becomes, under all circumstances, the medium in which the ossific process is first established. Bordenave believed that instead of the callus arising from the periosteum or from the extravasation of lymph, it was due to a process analogous to that which nature employs for the union of the soft parts. Dupuytren taught in 1819 the doctrine of the union of fractures by means of provisional and permanent callus

* Samuel D. Gross, M.D.: Anatomy, Physiology, and Diseases of the Bones and Joints. 1830.

† Mémoire de l'Académie Royale des Sciences. Paris, 1741.

largely derived from the periosteum.* Many years later Wagner† taught that the periosteum plays the principal part in the repair of the division of bone caused by resection, and to such an extent that it is sufficient of itself to form any bony material which may be needed to replace the bone removed. In the cranial bones it is probable that the dura mater takes the part of the periosteum. He adds that reproduction of bone, although only in a slight degree, may take place even without periosteum from the medullary cavity or the diploë, or from the soft parts which surround the bones. He says that the substance of the bone itself does not appear to contribute to the reproduction of bone, and that Klencke is the only author who expresses an opposite view. Since then the investigations of Paget, Klein, Billroth, Virchow, Cornil, and others have taught that new bone builds itself up out of most different materials, and that the theories regarding callus, which endeavored to show that it was developed in but one way or out of but one substance, *i.e.*, extravasated blood, periosteum, exuded fluids, medullary tissue, etc.,—each had a grain of truth, as all of those tissues occasionally take part in the repair of bone. The general belief still was, however, that, both as to the life and the growth of bone, the periosteum was almost or quite essential, and it remained for Mr. Macewen, of Glasgow, to demonstrate, as I believe he has done by a series of well-considered observations and experiments, the relative unimportance of the periosteal membrane and the possibility of ossification occurring around completely detached and isolated bony fragments. He has shown that, while on the one hand the periosteum is not the potent osteogenic factor which many thought it to be, on the other hand the soft tissues inclosed in the osseous tissue play the chief *rôle* in the development and reproduction of bone. I have had the pleasure of examining with him the case of regeneration of the humerus which he has recorded, and it certainly goes far to establish the truth of the above statement. Among the other propositions which he formulates ‡ is the following most important one: "Not only do detached portions of bone deprived of their periosteum live when reimplanted in their original position, but such portions are capable of living after transplantation. Parts of deeper layers of bone which had no periosteal connection have been transplanted and lived and grown." This statement is supported by both observation and experiment, and rests upon the fact that bone is produced and regenerated by proliferation of osteoblasts, and both its development and reproduction can take place independently of the medulla and periosteum. So far from regarding the periosteum as the structure which can alone secure or reproduce bone, the surgeon who accepts these teachings will not trust it to regenerate bone unless it has adherent portions of sound osseous tissue, from which alone by the process of proliferation can osseous regeneration take place. In January, 1887, Dr. Bernays, of St. Louis, reported § some experiments in which by the use of bone sawdust of various degrees

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* Gross, ibid. Cooper's Surgical Dictionary (London, 1825).

† On the Process of Repair after Resection and Extirpation of Bones. Sydenham Society, London, 1859.

‡ Annals of Surgery, vol. vi, 1887.

§ Med. Brief, vol. xv, page 48.

of fineness he produced bone in different positions, in the soft parts of the extremities, the abdomen, and back of two dogs. These experiments have not been confirmed, and Dr. Bernays records the fact that all his attempts to graft large pieces of bone in animals were failures, the pieces simply becoming surrounded by "periosteal bone-tissue" and remaining as foreign bodies, which subsequently had to be extracted.

The use of some method which should, in any case of operation on ununited fracture, or in excisions of joints or bones, meet the two indications of complete fixation of the fragments and the supply of a healthy stimulus to bone reproduction, has long been recognized by the profession. Dieffenbach's ivory pegs, the wire sutures of Flaubert, the seton of Valentine Mott, and the steel pins employed in the treatment of ununited fractures, are examples of various attempts in this direction, which have had varying degrees of success. In 1878 Dr. Alexander Patterson, of Glasgow, reported* a case of ununited fracture of both bones of the forearm, in the treatment of which a portion of dog's bone was used as a means of procuring union. The ends of the fractured radius were separated about three-quarters of an inch, and in this interval was placed a corresponding section of the humerus of a dog. It was held in place by a wire passed through holes drilled through the ends of the bones and then through other corresponding holes in the fragments of the radius. Its periosteum had been first reflected for a short distance, and was then brought down over the line of junction of the bones. The ulna was simply wired together, and later was found firmly united; but at the end of six weeks union was not complete in the radius, and the wound remained open for twelve months. At the end of that time the dog's bone, reduced to about half its size, came away, after which the wound healed completely. Without the knowledge of this unsuccessful case of Mr. Patterson, I recently, in a case of complete excision of the knee-joint, employed a similar portion of dog's bone for fixation of the femur and tibia. The case was one of extensive tubercular synovial disease, with softening and disappearance of the cartilages, and with caries of the head of the tibia and the condyles of the femur. At the proper stage in the operation one of the metacarpal bones of a medium-sized dog was removed with thorough antiseptic precautions, and brought to me in a warm carbolized towel. The piece of bone measured about three inches in length. A small cavity, just large enough to receive the end of the bone, was excavated in the lower extremity of the femur, and a corresponding one in the upper end of the tibia. The bone was then fitted tightly in place, and held the parts so firmly in position that the whole limb could be supported by the heel without displacement. It was dressed and placed in a bracketed wire splint. The subsequent course of the case was as follows: After a week or ten days, during which there was no elevation of temperature, there was a sudden rise to 102.5°. I found that there was an accumulation of sero-purulent fluid beneath the upper flap; on evacuation, this was found to be quite aseptic, but it continued to discharge for several weeks longer, gradually diminishing in quantity, but retain-

* *The Lancet*, vol. ii, 1878.

ing a gelatinous consistence, possibly due to admixture with synovial secretion. The temperature also remained slightly above normal. The patient's complexion and general appearance, and a slight cough, gave rise to the suspicion of pulmonary tubercle, though no physical signs were then discoverable. The limb remained in good position, the mechanical effect of the bone peg having been all that could be desired. There was no evidence that it was acting as a foreign body or in any way interfering with the process of repair. On the other hand, there was no marked advantage to be observed from its use, many cases of excision of the knee, in my experience, having done at least equally well under the use of the bracketed wire splint, and without other means of fixation having been used. When I last saw the patient (in the middle of June), about six weeks after the operation, he was apparently nearly well, and was likely to have a good limb. The case cannot be said to demonstrate anything conclusively as to the use of living bone in these cases, beyond the fact that such portions of dogs' bones can be made to serve the same mechanical purpose as ivory or steel pegs, and with no greater risk of acting as foreign or irritating substances. Many similar observations will be required to show whether or not they aid or hasten osteogenesis.—*J. William White, M.D. (Philadelphia, Pa.), in London Lancet.*

Secretory Fibers of the Sympathetic supplying the Parotid.—J. N. Langley (*Jour. of Phys.*, March, 1885) remarks that it is usually said that the parotid receives trophic but no secretory nerve-fibers from the cervical sympathetic, because its stimulation rarely excites any secretion. The author found, however, that stimulation of the sympathetic was always followed by secretion by the parotid, if the gland was previously prepared to secrete; or, in other words, the sympathetic secretory fibers are non-effective unless the gland has been supplied with a considerable amount of oxygen. The gland never failed in the author's hands to respond to sympathetic stimulation if it was previously prepared to do so by irritation of the chorda tympani, especially if a small dose of atropine sulphate had been injected into a vein. The relations of the submaxillary and sublingual glands to their cerebral and sympathetic nerves were found to be of a nature similar to the foregoing.—*New York Medical Journal.*

Cocaine in Surgery.— . . . After a previous failure, I have applied it, during the last six months, in about eighty to one hundred cases (half of which concerned extraction of teeth), mostly in policlinic practice, and with very satisfactory result. . . . For extraction of teeth I use cocaïne in the following way: I practice an injection of 0.005 gr. cocaïne on each side of the tooth between gum and alveolus, and then, after about five minutes, I apply the forceps. If the patient at this moment still experiences some pain, I wait for a while. In a great number of cases the effect was complete, *i.e.*, the patient did not experience any pain at all. In other cases of about the same number, a partial result only was to be noticed. Application and raising of the forceps was not felt in a painful manner, while the extraction itself was painful, although in a mitigated degree. In a small number of cases, in about six, cocaïne had no result at all. . . .

Concerning the dangerous feature of cocaïne, slight cases of intoxication—I only refer to acute intoxication, chronic intoxication not coming into account in this mode of application of cocaïne—are not rare, and even observations on serious, alarming phenomena are extant, as those reported by Mayerhausen, Bock, Schilling, Heymann, Mannheim, Robson, Kilham, Comanos Bey. A prominent instance is the well-known case of death caused by injection into the rectum of 1.2 cocaïne, having driven the physician Kolomnin, in St. Petersburg, to commit suicide. Another fatal case is said to have occurred in Warsaw in dental practice.

Slighter intoxications, the symptoms consisting in pallor, cold sweat, vertigo, heaviness and fatigue in the legs, sensation of anxiety, increased frequency of pulse, have been observed by me twice after application of 0.008 and 0.01 cocaïne. In one of these cases when nitrite of amyl was employed as an antidote, as frequently recommended, it rendered very good service in this quality.

I had an opportunity of observing a severe case of intoxication towards the end of February of the current year. A dentist, according to his statement, had injected under the gums of a 19-year old girl of strong constitution, although slightly chlorotic, 0.11 cocaïne, three-fourths syringe of a 15 per cent. solution in two portions, which was followed by the painless extraction of the carious tooth. The patient then became pale, fell backward, and the whole body was seized with convulsions of great violence.

These epileptiform convulsions continued for five hours with short interruptions, and during this time the patient was entirely unconscious, giving no signs of reaction to any excitation. The pupils were moderately wide and without reaction. The pulse, not to be counted in the beginning, subsequently showed a frequency of 176; the frequency of respiration was 44. After the convulsions had ceased, the patient lay quiet, unconscious. When awaking, she was unable to walk; she was only able to sit in a squatting position; she could not raise the arm; she had an intense aversion for light, diminished sensibility of the skin, the mucous membranes, the nose and the oral cavity, complete loss of smell and taste, dryness and burning in the throat, thirst; then appeared, at first less conspicuously, but increasing to excessive height in the next days, a condition of pronounced cardialgia; to this was to be added retention of urine during twenty-four hours, insomnia during thirty hours, complete lack of appetite during four days. While the other phenomena disappeared after two to three days, it took forty hours before she could walk with trembling knees. Cardialgia continued for six days. There were no permanent consequences to be noted. Nitrite of amyl had no visible effect in this case.—*Dr. Friedrich Haenel, Korrespondenzblatt d. Arztl. K. u. B. Vereine im Königreich Sachsen.*

Mucous Patches.—A solution of chromic acid is perhaps the best application to mucous patches, especially to those in the mouth and the pharynx. Use from two to five grains to the ounce.—*The Cincinnati Lancet-Clinic.*

THE

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ORIGINAL COMMUNICATIONS.

ODONTOBLASTS IN THEIR RELATION TO DEVELOPING DENTINE.

BY FRANK ABBOTT, M.D., NEW YORK.

(Read before the Joint Meeting of the American and Southern Dental Associations, Louisville, Ky., August 29, 1888.)

SINCE Virchow, in 1850, announced the opinion that the intercellular or basis-substance in all varieties of connective tissue, which he termed "connective-tissue substances," is a product of secretion, many histologists have adopted this view. Even to-day we meet with publications, both in English and German, holding fast to this secretion theory. It is, we admit, apparently the simplest of all theories, since it merely suggests that, at a given period of its existence, a cell should give out, from its contents, a certain amount of liquid, which eventually might become solidified, and even receive the lime-salts, forming the hard tissues such as bone, dentine, etc.

Fortunately, in 1861, we learned through the studies of the late Max Schultze that all intercellular or basement substances are products of the cells, inasmuch as a certain number of such cells would die, be transformed by a chemical process—not fully understood—into glue-yielding substance; whereas a certain other number of the cells would remain unchanged, and represent what have been called bone-cells, cartilage-cells, or connective-tissue cells in a general way.

An intermediate position between the two extreme views was taken by Beale in 1860, who claimed that the intercellular substance is a product of the transformation of the peripheral portion of the cell; so much so that an original large cell would, at its periphery, be converted into glue, or, as Beale has it, into "formed material," while the central portion would remain forming or living material, much reduced in size, and now termed a "connective-tissue cell." This latter view is still held by Klein, of London.

It was in the basis-substance of cartilage that Fuerstenberg, some forty-five years ago, by some chemical treatment of this tissue, discovered lines of demarkation between cartilage-cells, which Virchow afterwards baptized "territories." Obviously, territory means a central cell with a given amount of surrounding basis-substance. According to those who held to the secretion theory, the amount of basis-substance around the cell would altogether be a product of secretion of the central cell. Originally, in the embryo, the cells lay closely packed together, and, once having begun to exude the intercellular substance, became pushed apart, and eventually widely separated from one another, as seen in fully developed cartilaginous tissue. According to Beale, the whole territory was originally a large cell which in time became much reduced by the solidification of its peripheral portion.

Max Schultze claimed that the territory was originally protoplasm, or composed of a group of embryonal or indifferent corpuscles; the peripheral portion of the protoplasm, or the embryonal cells, becoming transformed into a glue-yielding basis-substance; during which process they became deprived of life, the central portion only remaining alive and retaining its shape as a cell. This is the theory held to-day by most advanced histologists, and we consider it correct in its main features.

In contradistinction to the "secretion theory," this has received the name of the "transformation theory." In 1873, C. Heitzmann added a feature of importance to Schultze's transformation theory. After having demonstrated that the basis-substance was *not* altogether devoid of life, but traversed by a net-work of living matter (which view was afterward corroborated by S. Stricker, of Vienna), he arrived at the following conclusions concerning the development of a territory: A territory was originally protoplasm, or made up of a number of protoplasmic bodies, the so-called embryonal or indifferent elements. Protoplasm, wherever found, is traversed by a reticulum of living matter; and, since embryonal corpuscles are protoplasm, they are inter-connected by delicate offshoots of living matter, which establishes a continuous net-work throughout the territory. Whenever, in the process of development of a territory, its peripheral portions are converted into glue-yielding basis-substance, the contents of the meshes alone are chemically altered, while the reticulum itself remains intact.

According to this idea, nothing but a liquefaction of the contents of the meshes is required, in order to render an already formed basis-substance protoplasm again. Such oscillation between protoplasm and basis-substance we invariably observe in the development of hard tissues; the territories becoming, after each return to the em-

bryonal or protoplasmic condition, more perfect, more solid, and more regular, as we see especially in the development of cartilage and bone.

Let us now apply the view here advanced to developing dentine, a tissue which we may consider as a highly perfected one, surpassing in its individuality and refinement of structure any of the ordinary osseous formations. In the dentine itself there are no cells; all we see is the fibers of living matter, the tenants of the canaliculi and their offshoots passing into the basis-substance. The main mass is not cartilaginous, as was previously supposed, but glue-yielding, especially dense and indestructible immediately around the canaliculi, and infiltrated with lime-salts. The only formations deserving of the term "cells" are the odontoblasts, those peculiar, elongated bodies (of a shape and size to remind one of columnar epithelia) usually seen at the periphery of the papilla in developing, and at the periphery of the pulp-tissue in developed teeth.

We know of these peculiar protoplasmic bodies, that they send offshoots upward into the dentine (the dentinal fibers), offshoots laterally connecting one with another, and other offshoots downward, uniting them with the medullary elements of the papilla.

The first to see and describe all these offshoots was Franz Boll, in 1868, and he was corroborated by Waldeyer, in 1869. Before these offshoots were known, attempts at explaining the formation of dentine were made, first by A. Kölliker, in 1852, in his handbook of histology. On page 385 he says, "In the formation of dentine not the whole pulp is concerned, but only its outermost layer of epithelium-like cells, which, by a continual prolongation of the original cells, *under a continuous multiplication of the nuclei*, apparently keep up the same thickness.

"I am not willing to maintain that one and the same cell is sufficient for the whole duration of the formation of dentine, for I consider it as quite possible that, from time to time, the dentine cells are replaced by others forming at their inner side. What I deny is, that the whole pulp is transformed and ossified from without inward."

Kölliker, at that time, knew nothing about the presence of dentinal fibers. In order to explain the formation of the dentinal canaliculi he, on page 386, discusses the following three possibilities:

1st. The canaliculi are the remnants of the cavities of the dentinal cells, which, in the process of ossification, become thickened and hardened in their walls, but are not perfectly closed.

2d. The canaliculi originate from the nuclei of the dentinal cells, which elongate and coalesce, but retain their central cavities.

3d. The canaliculi are produced by a process of resorption in the previously homogeneous dentinal tissue, in a manner analogous to

the formation of the Haversian canals, or the canaliculi in the cementum.

Of these three possibilities, Kölliker considered the first as the most probable for the formation of the main canaliculi, and was convinced that the third possibility alone can explain the origin of the fine branching canaliculi. He distinctly states that no other tissue is concerned in the production of dentine but the cells which later were dubbed odontoblasts, and that these, by a successive taking up of the lime-salts, become dentine. He, therefore, as early as 1852, although upholding the secretion theory unswervingly from that time up to date, for the formation of dentine adopted the opposite or transformation theory. About ten years later he and John Tomes discovered the dentinal fibers, and, with their acknowledged presence within the canaliculi, and their connection with the odontoblasts, the difficulties in explaining the formation of dentine have considerably increased.

Are the dentinal fibers remnants of the central portion of the odontoblasts, whose lateral portions become transformed into basis-substance? Are the dentinal fibers formed between the odontoblasts, after the latter have become basis-substance? So great, indeed, seemed the puzzle, that quite recently R. R. Andrews deemed it advisable to reiterate a previously expressed opinion of E. Klein and others, that there are two sets of odontoblasts, some with broad bases which become basis-substance altogether, and others pear- or spindle-shaped, with long projections, which become the dentinal fibers. These latter they termed "fibril-cells."

It would seem to require but a very limited amount of histological or microscopical experience to satisfy oneself of the untenableness of these views, as, with not a very high power, projections may be seen running from every odontoblast into the canaliculi of the formed dentine, some giving off one, some two, some three; and even as many as five offshoots have been seen arising from a very broad end of an odontoblast, and penetrating the canaliculi. The "fibril-cells," therefore, are nothing but narrow wedges between broad-based odontoblasts, especially numerous where the periphery of the papilla forms a sharp curvature, such as on the pointed cusps.

After eight years' study, Bödecker and Heitzmann have announced that the odontoblasts are not direct dentine-formers; that they break up into embryonal or medullary corpuscles shortly before the appearance of the basis-substance, which at first appears without lime-salts; and that the dentinal fibers, originally in connection with the odontoblasts, of whatever shape, after the breaking up of the latter into embryonal corpuscles, become situated

between these, and so remain in their respective canaliculi, even after the calcification of the dentine is accomplished.

From personal studies I am fully convinced of the correctness of this position. Unquestionably there are portions in a developing tooth where the odontoblasts lie unbroken against the formed dentine. This we consider a condition of rest for the time being. For, more frequently, we see the odontoblasts split up into smaller portions of protoplasm which we term medullary or embryonal elements, and whenever this is the case we see the fibrils passing into the already formed basis-substance of dentine, between the rows of embryonal corpuscles. This explains to us why the living matter present in the medullary corpuscles remains unaltered, even after the formation of the glue-yielding basis-substance, and its infiltration with lime-salts. This explains, further, why the dentine, after the liquefaction of the basis-substance, in pathological conditions, breaks up into medullary or inflammatory corpuscles, a fact that I observed and first described in 1879, in the process of caries of living dentine, and which was later corroborated by Bödecker in his studies upon ebonitis.

Several questions, however, require our close attention in the history of the development of dentine. One of these is, Are the odontoblasts absolutely necessary as a pre-stage to the forming dentine? And secondly, How is it that the odontoblasts produce a continuous mass of dentine from the periphery to the pulp, if they are converted into basis-substance in layers? For we know that the dentine is only in exceptional cases stratified, and one would expect that such lines of stratification would be of common occurrence if one row of odontoblasts after another were converted into basis-substance.

As to the first question, we are unable to give a positive answer, but take it for granted that they are. We often see, at the summit of the papilla, medullary tissue bordering the already formed dentine without a trace of odontoblasts. Through the researches of John Tomes, we know that the odontoblasts originate by coalescence of medullary corpuscles of the papillary tissue; and we know, furthermore, that the odontoblasts again return to the medullary condition before becoming infiltrated with lime-salts. It appears possible that previous odontoblasts have been transformed into medullary tissue, and no new ones produced at that particular period.

To the second question, whether or not the odontoblasts form a single row for the time being, thus involving an interruption in the appearance of the basis-substance of the dentine, a positive answer can be given, in accord with the observations of Kölliker in 1852, above quoted. The difference, however, is sufficiently marked between his and our views to, in our judgment, demand attention.

He claims that there is but one row of odontoblasts capable of producing dentine, and that these become continuous by a proliferation of the nuclei of the original single row, and their elongation thereby. He distinctly denies that the pulp as a whole could be

FIG. 1.

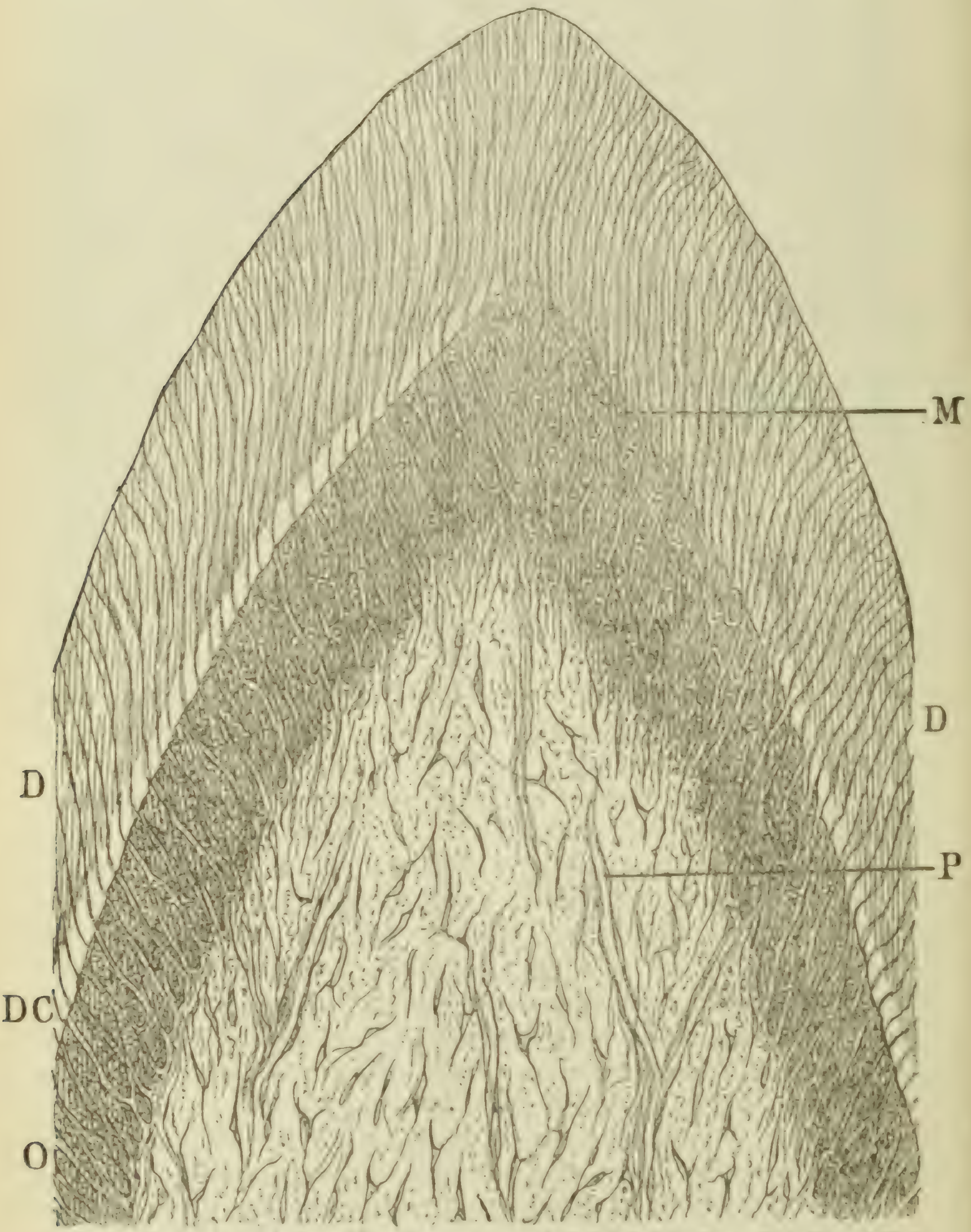

FIG. 1. Tooth of a pig's fœtus 10 centimeters long. *D, D,* Calcified dentine. *D C,* Non-calcified dentine. *O,* Row of odontoblasts, partly fully formed, partly forming. *M,* Odontoblasts broken up into medullary corpuscles in the process of formation of dentine. *P,* Vascularized myxomatous tissue of papilla. × 200.

converted, layer after layer, into odontoblasts. We, on the contrary, agree with John Tomes in the view that the medullary corpuscles of the papillary tissue are progressively converted into odontoblasts, which explains the fact that, with the advancing growth of the dentine, the bulk of the papilla diminishes. We add another point, viz, *that each odontoblast, while being reduced to medullary corpuscles at its distal or peripheral end, is being added to by an attachment of medullary corpuscles of the papillary tissue at its proximal or central end.*

Undoubtedly there are periods of comparative rest, in which a fully developed odontoblast borders the dentine, and dips into the papillary tissue with sharply defined contours, with its narrow and pointed end. As soon, however, as the building of dentine is resumed, the peripheral end of the odontoblast is seen to have divided itself into medullary bodies again, and, simultaneously, rows of medullary corpuscles are superadded to the opposite or central end.

A beautiful illustration of this process may be seen in the developing tooth of a pig's fœtus, ten centimeters long (see Fig. 1). Here we see several rows of odontoblasts, bordering the non-calcified portion of the basis-substance of the dentine. At that portion in which unchanged odontoblasts stand against the dentine, others are attached to the uppermost row, likewise in full development. This we consider as a condition of comparative rest. At that portion, on the contrary, in which the odontoblasts are replaced by medullary corpuscles toward the dentine, without a distinct boundary-line between the two, we see rows of medullary corpuscles attached to the inner ends of the odontoblasts, whereby the transverse diameter of the odontoblastic layer is noticeably broadened. In the former instance, the layer of odontoblasts is fairly well marked toward the papillary tissue; in the latter instance it is indistinct, the odontoblasts blending with the papillary tissue.

High powers of the microscope illustrate still better this claim (see Fig. 2). At the same time it becomes evident that the dentinal fibers, originally attached to and connected with the odontoblasts, become situated between the medullary corpuscles as soon as the former are converted into the latter. Wherever we notice rows of medullary corpuscles at the inner ends of the odontoblasts, delicate fibrillæ are seen coursing between their rows or groups.

Since, according to our views, the myxomatous basis-substance of the papillary tissue is supplied with living matter, the same as are the so-called cells, there is no difficulty in explaining the origin of new protoplasmic bodies from the previous myxomatous basis-substance, for the benefit of continuous additions to the odontoblasts.

The facts just described are well illustrated in the developing teeth of a human fœtus from six to seven months old (see Fig. 3).

The cusp of the dentine shows stratification, although no odontoblasts are seen at the summit of the papilla. At the sides of the cusps, odontoblasts make their appearance, broken up into finely

FIG. 2.

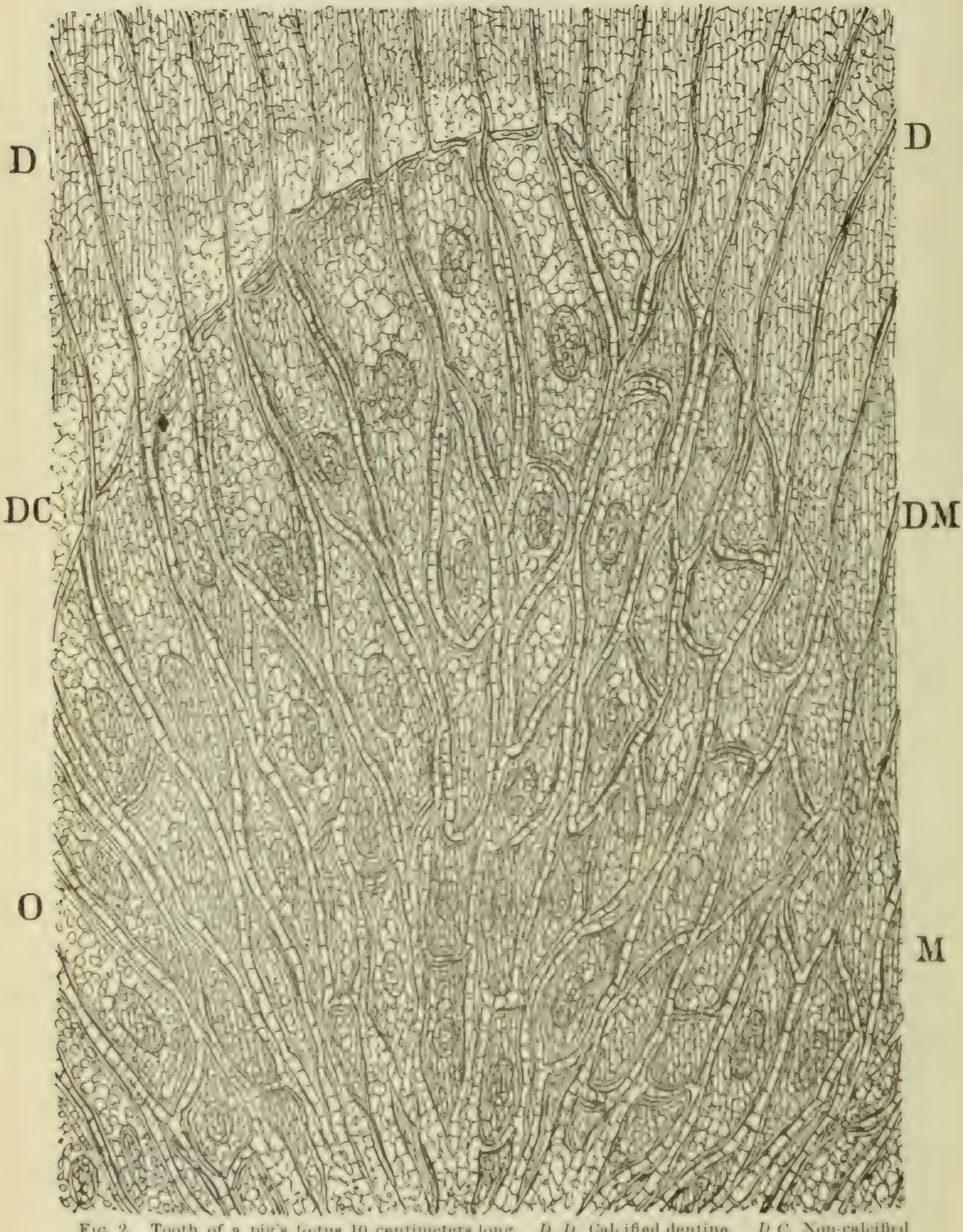

FIG. 2. Tooth of a pig's fœtus 10 centimeters long. *D, D*, Calcified dentine. *D C*, Non-calcified dentine. *D M*, Dentine in the process of formation from medullary corpuscles. *O*, Odontoblasts in multiple rows, spindle-shaped elements wedged in between the broad odontoblasts. *M*, Medullary corpuscles arisen from odontoblasts, such corpuscles also attached to the distal ends of the odontoblasts. × 800.

granular medullary corpuscles, toward the non-calcified basis-substance of the dentine, and augmented in their bulk by rows of glistening, almost homogeneous, medullary corpuscles, toward the

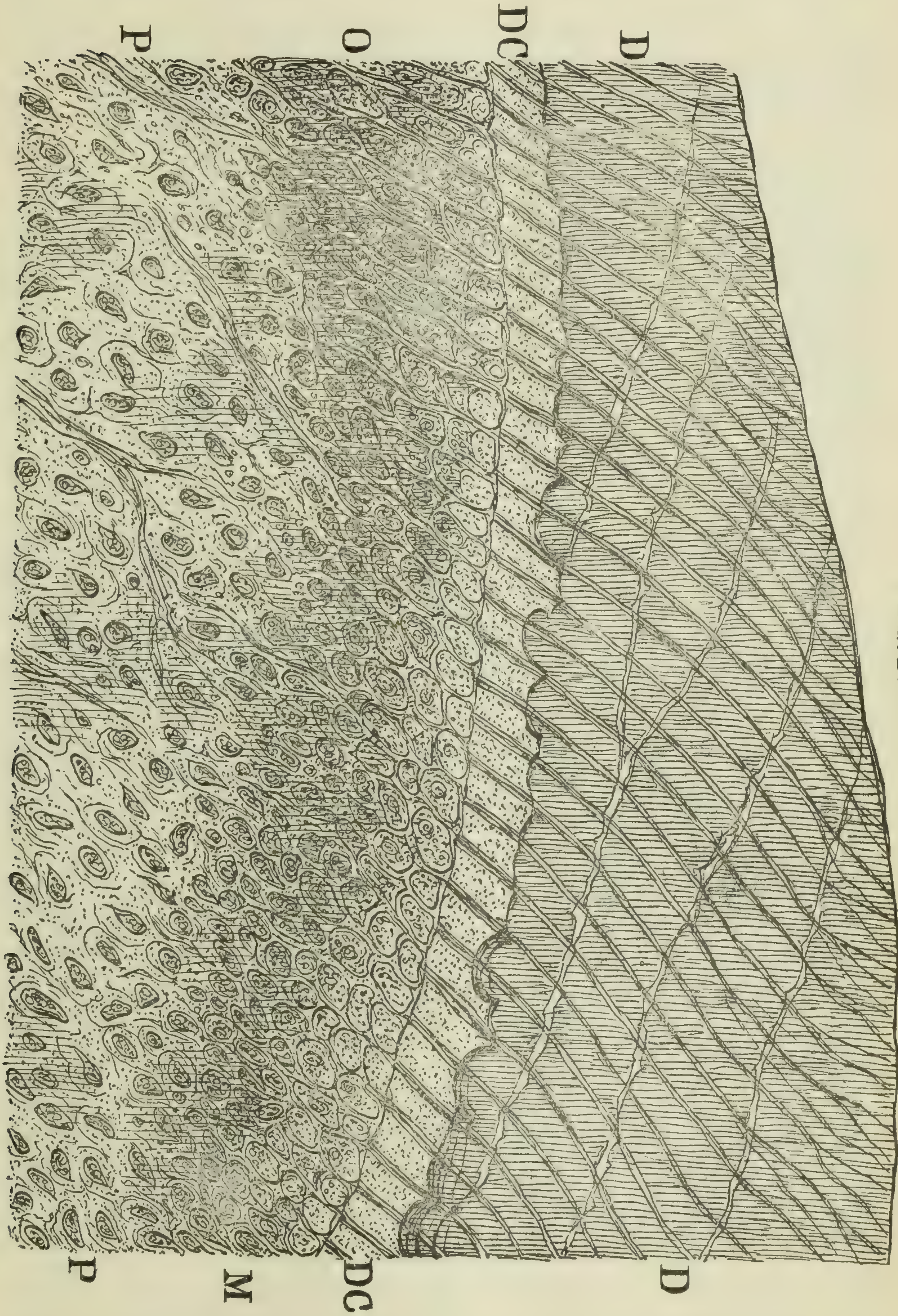

FIG. 3.

FIG. 3. Tooth of a human fœtus, 6 months. *D, D,* Calcified and stratified dentine. *D C, D C,* Non-calcified dentine, the border of the calcified dentine being marked by globular formations. *O,* Odontoblasts splitting into medullary corpuscles toward the dentine, and showing rows of such corpuscles at the distal ends. *M,* Medullary corpuscles ready for the transformation into basis-substance of dentine. *P, P,* Myxomatous tissue of papilla. × 400.

papillary tissue. Occasionally we meet with a basis-substance of dentine not yet calcified, and still exhibiting its composition of medullary corpuscles (see Fig. 4).

FIG. 4.

FIG. 4. Tooth of human fœtus, 7 months. *D D*, Dentine calcified. *D C*, Non-calcified basis-substance of dentine, close above the capillary blood-vessels, broadened and visibly made up of medullary corpuscles. *C*, Capillary blood-vessel in transverse and longitudinal section. *M*, *M*, Medullary corpuscles ready for infiltration with basis-substance. *M O*, *M O*, Medullary corpuscles arranged in rows for the formation of odontoblasts. × 800.

Upon studying this specimen, all doubts as to the origin of the basis-substance of the dentine must vanish. All previous attempts at explaining how the odontoblasts are converted into dentine must prove futile in the face of such a specimen. Although we admit that such a plain instance is only exceptionally seen, we thought it to be so instructive and so convincing that we had an illustration made with a very high power. With the facts advanced, a hitherto mooted question seems to have found solution.

As to the question why dentine in all its stages of development appears to be a continuous mass, and but exceptionally interrupted by marks of stratification, the explanation is that the odontoblasts themselves are continuous. Not the original odontoblasts are preserved and augmented from the periphery toward the center; but all that is converted of an odontoblast into dentine, at its peripheral portion, is made good by the addition of medullary corpuscles at their central ends or portions, from the tissue of the papilla, both the protoplasmic bodies and the basis-substance.

ETIOLOGY OF IRREGULARITIES OF THE JAWS AND TEETH.*

BY EUGENE S. TALBOT, M.D., D.D.S.

V.

Asymmetry of the Maxillary Bones.

Haskell's Deformity.†—When we examine models of the superior maxilla after absorption of the alveolar process has taken place, we observe that in the cuspid and bicuspid region, high above the alveolar border, a marked depression exists upon either side. Fig. 1 shows a base-plate which has been formed over such a model. The plate is more depressed at the left than at the right side. This peculiar deformity is familiar to the operator who arranges teeth and waxes up plates for the purpose of restoring the contour of the face. Upon closer inspection of the model it will be seen that there is an asymmetry of the lateral halves of the maxillary bones. With Dr. Haskell's assistance I have examined 298 models, finding 268 out of the number with marked depression on the left side, and 24 with the depression on the right side, and only six cases showed both sides to be alike. It is remarkable that so large a proportion of the cases of this deformity should be found existing on the left side.

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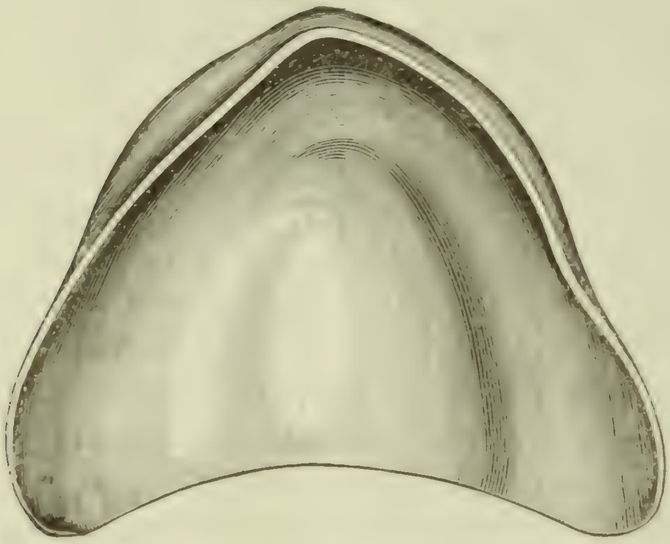
† I have named this deformity "Haskell's Deformity," for the reason that Dr. Haskell called the attention of the profession to this peculiar condition of the maxillary bone years ago, personally and through the journals, and says he has found but one dentist who had observed it.

Dr. Haskell says, "For many years I have observed a marked difference between the right and left sides of models of both the upper and lower jaws, but more especially noticeable in the upper jaw. It is not so apparent upon a casual glance at the model, for it is not so much in the alveolar process as in the maxillary bones. But a plate swaged upon a model from an impression taken high over the region of the cuspids (as ought always to be done) shows at once the depression of the left side, which occurs, to a greater or less extent, in 95 per cent. of cases. The difference becomes apparent in arranging artificial teeth. Every dentist of experience must have observed that greater length of teeth and gums is required upon the left side than upon the right. How often it is seen that the left side of the lip rises higher, in talking and laughing, than the right side. The difference in the two sides of the lower jaw does

FIG. 1.



not occur as often, but is apparent in the divergence of the left side from a line drawn through the center of the model, so that the posterior teeth on that side must be set farther in upon the plate."

Dr. Haskell has, during the past twelve years, frequently called my attention to this peculiar deformity of the jaw. My own observation of models and patients has also indicated the probability that the majority of deformities of this nature exist on the left side. The theory advanced by Dr. Gallippe, that, because we are right-handed by inheritance, we masticate upon the right side, does not account for this deformity, since the left alveolar process is moved out of its natural position and is carried some distance toward the left. The following theory for this deformity suggests itself as worthy of our consideration: Man, like some other members of the animal kingdom, normally moves the lower jaws from right to left in mastication. The constant friction of the lower teeth against the upper carries the superior arch with the alveolar process toward the

left. By pressing the index finger over the cuspid and bicuspid roots, above the alveolar process, we shall find that the majority of mouths contain teeth with their roots standing out more prominently upon the right side than upon the left side. The right superior dental arch, like the arch of a bridge, resists such inward force because of the lateral contact of its teeth. On the contrary, the left superior dental arch may thus be carried slightly outward. The limited lateral motion during occlusion prevents the teeth and alveolar process from being carried farther. The cuspid tooth may be prevented from being carried in as far as it otherwise would be owing to the lateral motion of the lower jaw to the left. The alveolar process is thus carried beyond the border of the maxillary bones. After the teeth have been removed, absorption of the alveolar process occurs, leaving only the alveolar ridge. The ridge then overhangs the maxillary bone, thus producing a depression upon the left side. This is the reason that, in arranging artificial dentures in many cases, the teeth are carried over the alveolar border farther than upon the right side to obtain proper articulation with the natural teeth upon the lower jaw.

On examining the model upon which the base-plate was formed, it will be seen that both the right and left alveolar borders are symmetrical. The alveolar border in most cases indicates the contour of the teeth when in position.

Asymmetry in the Rami.

A case recently seen with Dr. G. Frank Lydston, of this city, is a marked illustration of congenital maxillary asymmetry. The man is thirty years of age. The inferior maxillary is small and the chin pointed and narrow. There is a difference of one-half an inch in the length of the rami, the left rami being the shortest. The difference is sufficient, when the face is smoothly shaven, to produce a noticeable deformity. The teeth are irregular in both jaws, the irregularity, however, being most marked in the superior jaw. The cranium partakes of the asymmetry, and the frontal suture is plainly marked. Numerous irregularities of the surface of the skull are observable. The larynx is displaced at least one-half an inch from the median line toward the left side. There is no history of injury, and a point of interest in this case is the fact that the asymmetrical and small jaw is a family characteristic, and has been noticed for several generations. The jaw, in this case, resembles the father's, while the arrangement of the teeth is precisely like that of the mother's. The upper portion of the body appears to have been developed in two lateral halves, and when brought together the left side of the body was higher than the right side. The cranium and

maxillary bones show this deformity quite conspicuously. The teeth, which are comparatively sound, are all present. The left superior maxilla is considerably higher than the right. Occlusion is perfect, thus compensating for the short left ramus.

Asymmetry in the Body and Improper Occlusion.

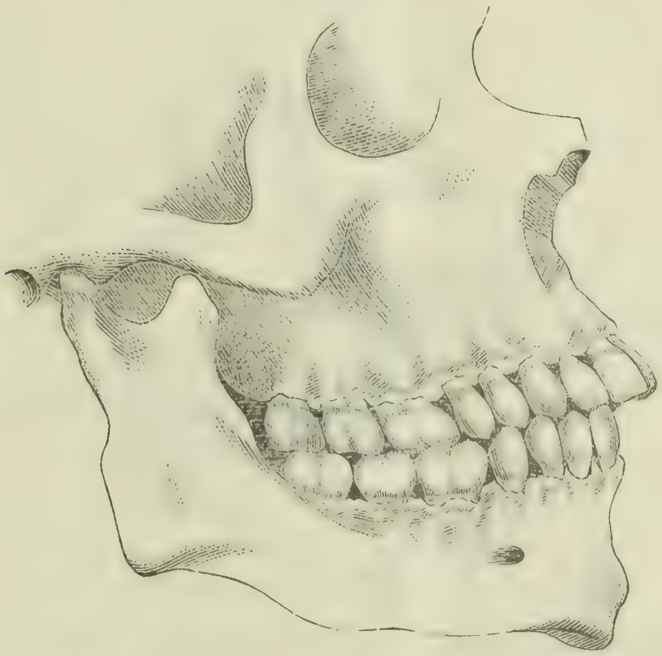
The daughter of an old patient of mine came to me for treatment September 14, 1888. She was about seventeen years old, and had quite a prominence upon the right side of the lower jaw, and another, although not so marked, upon the left upper jaw. The left corner of the mouth was nearly one-quarter of an inch higher than the right. The face was full and had a peculiar expression, owing to the mouth and jaw being at an angle when closed. Upon examination, I found the left superior maxilla one-quarter of an inch higher than the right side. The alveolar process and teeth shared the same irregularity, thus placing the line of the teeth on the same plane as the lips. The body of the inferior maxilla, from the symphysis to the angle, seemed to be longer upon the left side than upon the right. When the jaw closed, the median line of the lower jaw was half an inch to the right of the upper. The lingual cusps of the bicuspids and molars on the right side of the lower jaw occluded with the buccal cusps of the bicuspids and molars of the upper, and *vice versa* upon the left side.

The two cases just described are interesting from the fact that while the causes and the external appearances of the face are entirely different, the alveolar processes and the occluding surfaces of the teeth are on the same angle, the inclination being in the same direction. This deformity is frequently found in the mouths of patients over forty years of age, where all the teeth have been removed upon the side of one jaw and upon the opposite side of the other, the alveolar processes containing the teeth elongating upon the side where there is no antagonism, and throwing the occluding line of the teeth out of position at an angle similar to that above described.

By examining the mouths of 1977 idiots there were found to be 159 with protrusion of the superior maxilla, and 92 with protrusion of the inferior maxilla. These deformities do not exist to such an extent among healthy individuals. This inharmonious development of the maxillary bones may extend from the articulation to the incisor teeth. Such deformities are rarely found in connection with the first set of teeth. When the superior maxilla protrudes during the period of the temporary teeth, it is usually caused by thumb-sucking. Protrusion of the inferior maxilla is the result of the abnormal development of the rami or body of the jaw. As these abnormal conditions usually correct themselves when the temporary

teeth are shed, they consequently receive little attention. But where these deformities arise during second dentition the jaws are determined towards false positions, thus endangering the beauty of the face. We occasionally see excessive growth or hypertrophy of the superior maxilla. When the teeth are normal in size they appear small in proportion to the abnormally large jaw. They are carried forward with the alveolar process to such a degree that the teeth and lips may protrude. In such cases it appears as if the body or rami of the inferior maxilla were much shorter than is natural, but by close inspection we shall see that the inferior maxilla is normal and quite a space exists between the superior and inferior central incisors. Protrusion of the superior maxilla is a common defect; it

FIG. 2.

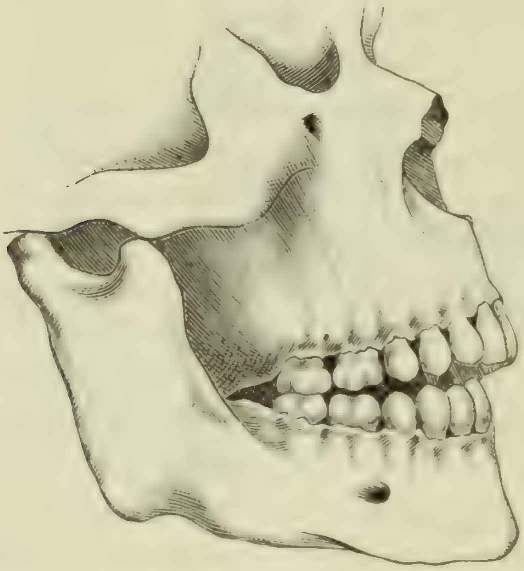


is accompanied by a depression of the face at the root and alæ of the nose, and a protrusion of the anterior alveolar process and upper lip. If the maxillary bones, as well as the alveolar process, are enlarged, the teeth will stand perpendicularly with the alveolar process. If the superior maxillary bones are small, the teeth will protrude from the perpendicular to an angle of 45°. Such a case is illustrated by Fig. 64, page 131, Kingsley's "Oral Deformities," and in Fig. 130, page 145, Talbot's "Irregularities of the Teeth;" this is a deformity frequently met with in practice. A common cause of protrusion of the superior maxilla is illustrated in Fig. 2.* The teeth in the upper jaw are fully erupted, but are directed downward and forward. The teeth in the lower jaw are in their proper positions. It will be observed that the rami of the jaw are inharmoniously developed, the

* These cuts represent cases in my practice.

rami being so short, when the jaws close, that the occlusion throws the superior teeth and alveolar process forward. In this case the alveolar process is quite thin, because the arch is high and the teeth have long slender roots and are easily carried forward. The inferior maxilla is large, the structure dense and hard, and the teeth firmly fixed in position in the jaw. When occlusion takes place, the weaker structure (the superior maxilla) is carried forward by the stronger (the lower maxilla), thus forcing the alveolar process forward. The shortness of the rami of the inferior maxilla causing improper closing of the jaws is a feature strongly impressed upon the dentist who undertakes to insert artificial dentures. The tendency of the lower jaw to force an upper denture out of the mouth, by striking the teeth at an angle instead of perpendicularly, is a marked illustration

Fig. 3.



of the inharmonious development of the jaws. The same difficulty is frequently experienced with the partial lower plate when it presses against the anterior teeth and alveolus, forcing them both forward by improper articulation. The occasional grinding of the surfaces of the artificial molars to produce proper articulation affords another illustration of the effects of this inharmonious development.

Imperfect Occlusion.

Fig. 3 illustrates a deformity produced by the before mentioned cause, yet the result is very different. The case is that of a boy fourteen years old. Before the eruption of the second molars the articulation was perfect, but as soon as the second molars occluded the jaws were forced open. The rami are so short that when the second molars and the alveolar processes of the superior and inferior maxilla come together, a space exists between the central incisors.

Unlike the former case, the superior alveolar process is remarkably well developed and the teeth are firmly fixed in the jaw. The roof of the mouth is quite low. The position of the teeth in the alveolar process is such that when the lower teeth occlude they strike directly on a line with the long axes of the roots, thus preventing the forward movement of the teeth and alveolar process. The inferior maxilla is not well developed, nor has it the power to overcome the resistance and force the superior alveolar process and teeth forward, as exemplified in Fig. 2. When the rami are short, so that they do not harmonize with the maxillary bones, the movement of the jaws may be likened to the arms of shears: the farther the points are from the center, the greater distance they have to travel. A slight movement at the center will cause them to move a considerable distance. In a similar manner, a slight excessive protrusion of a molar will cause the anterior teeth to become separated. The shorter the rami, the less the harmony between the jaws and teeth. The farther back the protruding molar, and the more it projects, the greater the anterior separation of the jaws. The excessive eruption of the second and third molars is often due to the persons sleeping with the mouth open. Not infrequently the mal-occlusion of the oral teeth is due to the inability to close the jaws on account of the inharmonious development. Occasionally there are mouths in which the molars and bicuspids occlude and there is just enough space between the centrals to admit a thin spatula. January, 1887, a patient was brought to me for advice whose jaws, when closed, showed a space of half an inch between the incisors. The pressure of the jaws upon the molar teeth is in some instances so great that normal eruption is impossible. In such cases the molars will protrude through the gum and the superior and inferior processes will occlude when the jaws meet.

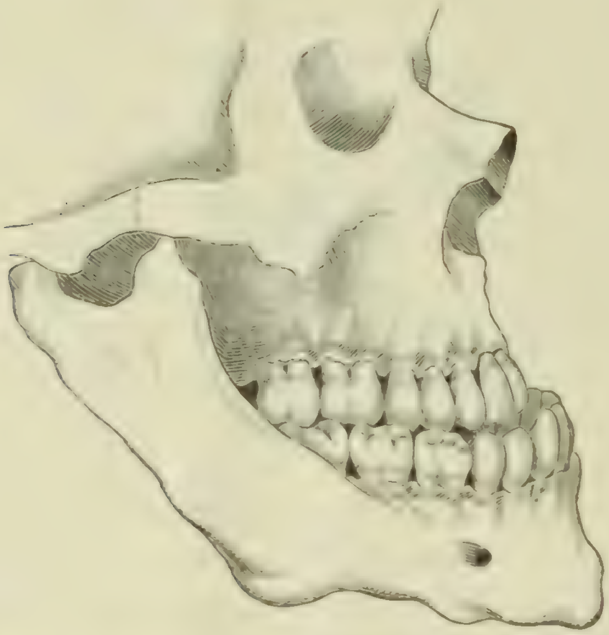
Protrusion of the Inferior Maxilla.

Protrusion of the inferior maxilla produces one of the most repulsive deformities of the face, and should be corrected as early in life as possible. When it is caused by or associated with arrested development of the superior maxilla, it is extremely difficult to restore to the features a natural expression. A case of considerable interest, illustrated by Fig. 4, came to my notice in 1887. A commercial traveler from New York called at my office for the purpose of having a gold crown re-set. I noticed a marked deformity in the jaws, consisting of a depression at the alæ of the nose and an unusual protrusion of the inferior maxilla. Upon examination I found that the second molar on the upper jaw and the third molar on the lower jaw were the only teeth that occluded. This was caused by an excessive

length of the rami of the lower jaw. The body was normally developed, but was carried forward by a lengthening of the rami. There are cases where the lower jaw projects beyond the upper, but by closely examining the deformity we find that another cause exists for this appearance.

A girl fifteen years of age was sent to me for treatment by a dentist from a neighboring State. He desired me to "force the inferior maxilla back into place." I found the rami and body of the jaw apparently normal. The external appearance of the chin and cheeks was in keeping with the outline of the face. I observed that the upper lip was much depressed and that deep lines extended from the alæ of the nose to the corner of the mouth. Upon opening the mouth, I found arrest of development of the superior maxilla. The superior incisors closed inside of the inferior incisors; the first and second bicuspids, first and second molars, were in position, but had crowded forward close to the lateral incisors. The cuspids were quite outside of the arch. The superior dental arch had to be forced out instead of carrying the inferior maxilla in, which would tend to further complicate the case. In the majority of cases which appear to result from a protrusion of the lower jaw we shall find that the lower maxilla does not project abnormally, but the superior maxilla being arrested in its development gives the protruding appearance to the lower jaw. Before undertaking to correct such a deformity, the general contour of the face should be carefully studied.

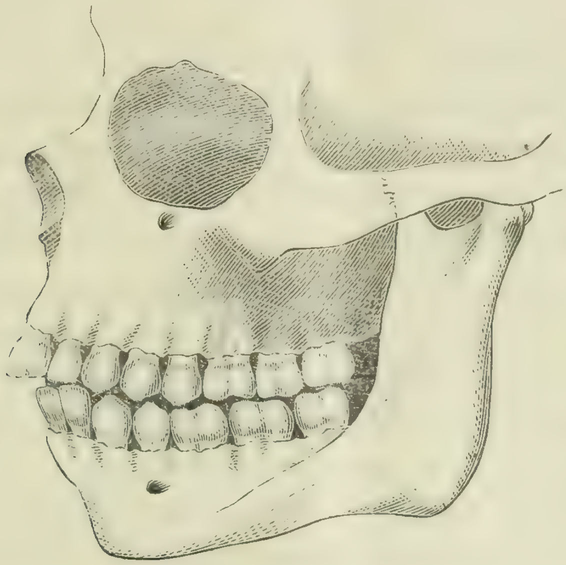
FIG. 4.



A peculiar but rare deformity of the inferior maxilla is illustrated in Fig. 5. The body of the jaw is very short. A line dropped per-

pendicularly and touching the chin at the median line would pass through the bicuspid region of the superior maxilla. A front view of such a deformity gives an appearance as though the lower jaw

FIG. 5.



were absent, and a side view throws the nose out prominently, while the chin and forehead retreat. The rami of the jaw are larger than the body. The articulation is good, the defect being that in the incisor region the teeth strike quite a distance posterior to the superior incisors.

FIG. 6.

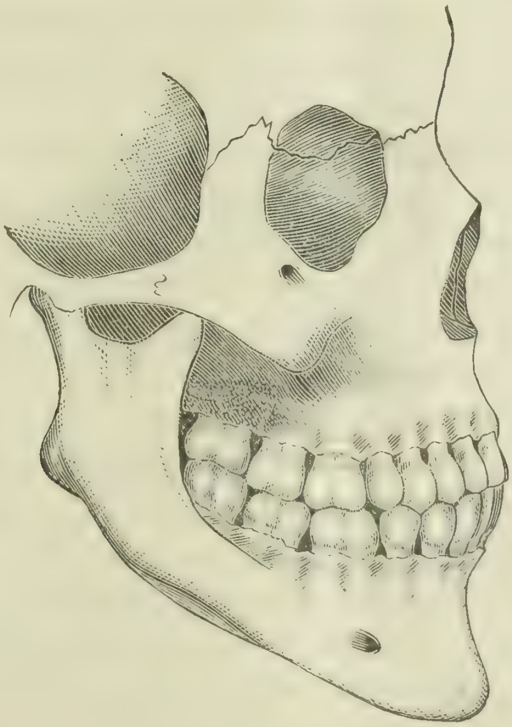


Fig. 6 represents jaws such as are frequently seen. The long body and protruding chin, narrow and contracted alveolar process on the lower jaw, a small superior maxilla and thin protruding al-

veolar process are in keeping with the thin faces and sharp features of the class. The body of the inferior maxilla is small, thin, and very delicate; the rami unusually short—just the opposite to the one last described. A line drawn parallel with the occluding surfaces of the teeth would meet the angle of the jaw, which, in a normal jaw, would extend from one to one and a half inches below the line. Naturally slender, delicate muscles and tendons are associated with such bones. In these cases dislocation of the inferior maxilla is liable to occur while yawning or during dental operations, so great is the leverage. In this instance the length of the jaw compensated for the width, so that in this particular case the teeth were not irregular, although irregularity frequently accompanies this peculiar formation of jaw. This is particularly the case with the saddle or V-shaped arches on the upper jaw and the saddle-shaped and forward inclination of the molars, bicuspids, and cuspid teeth on the lower jaw. The roof of the mouth is also very high and the alveolar process very thin, giving the roots of the teeth but slight support. The same principle of organization and structure is operative in the alveolar process and teeth of the lower jaw.

THE "PERSONAL EQUATION" IN THE DENTAL PROFESSION.

BY A. H. THOMPSON, D.D.S., TOPEKA, KANSAS.

WITH mathematicians in general and astronomers in particular, there is a well-known element of error in the observations and calculations of all persons, which is called the "personal equation." This is the unconscious mental variant which induces lack of accuracy, the under- or over-estimation of numbers, values, etc., either in making observations, in recording them, or in making calculations therefrom. This tendency augments or diminishes results, so that absolute accuracy is never attained by any one individual. What is curious about the personal equation among astronomers is, that each individual is disposed to vary in a definite direction, and in a more or less definite proportion. This is his personal equation, and when it becomes known, he or any one can apply the check by correcting his work in about that proportion in order to bring it nearer exactness. Allowance must be made for the personal equation in all calculations. All men have this mental variant, and it affects their work in proportion to its direction and degree in each individual. A perfect man without error, who is always exact, would be a prodigy, as a perfect mathematician is. On account of imperfection, the excess or lack of various mental qualities, all men are prone to err, whatever their work.

In all fields of science and thought this human disposition is made

manifest, although in no other science, save mathematics, is there a scientific application of a check for the elimination of the inevitable error. In making such a provision, mathematics again demonstrates her right to the claim of being the most exact of the sciences. Other sciences which aspire to exactness should also make allowance for the unknown quantity, the personal equation, as a source of error; but do not do so, and much confusion arises in consequence. In chemistry, for instance, how variable are the results attained by different investigators from experiments apparently conducted according to the same rules and proportions. This variability is so conspicuous as to often lead to the impeachment of the honesty or intelligence of the observers. But the source of error—and all observers err continually, even though the amount may be humanly imperceptible—is in their humanity, their natural imperfection of mental organization which the individual cannot help, of which he is unconscious, and for which he should not be held responsible. The minute error which escapes his utmost vigilance, creates the fraction which causes the result to fall short of perfection.

How marked has this variability been in the chemical researches by experts in the dental profession! What impeachments have been heaped upon innocent heads, and what heart-aches have been caused by cruel misunderstandings and unintentional misrepresentations!

And this applies, of course, not only to chemical researches, but also to other branches of science, and not alone to the dental profession, but to other bodies of scientific men. This is due to absence of scientific charity. These hasty critics never pause to consider that the votaries of science cannot be dishonest! Men may cheat and steal in finance or literature or art, but they cannot trifle with science, and misrepresent either observations or calculations or deductions. Science is a vigilant and exacting mistress, and her vengeance is swift and terrible! The very nature of the work makes trifling impossible. The worker must be honest, or his results will be valueless and ruinous to his project. Reactions will not lie to please him. Results always tell the truth and mercilessly expose imposture. So scientific dishonesty is impossible.

Nor is it ignorance. There is no man who essays to teach science, but who has a grasp of and knows more about some particular thing than others. In his direction he has a peculiar faculty, all his own, of looking at things, which is different from that of every other observer. The mind varies as much as the face. Again, it is not the most highly favored who are always nearest the truth and emit the most light. The mediocre mind, the most meagre intelligence, may, by reason of its high development in one direction, be given an insight into great principles which is denied to greater minds. How often

are we impressed by the clear-cut perception of a great truth, or one phase of it, by a very ordinary person. That is inspiration; or rather, it shows that all intelligent persons, at least, are entitled to consideration for the superior qualities which may be all their own. Every intelligent person is right so far as he can see clearly, although he may err, as all men do, where his personal equation biases his judgment.

So while we may safely grant that every observer is honest and intelligent in his own field, we must also admit that he is necessarily and unconsciously imperfect. He may observe never so closely and carefully, or collect and tabulate with apparent exactness, or make his deductions with scientific precision, but, through his one weakness, or perhaps excess of one mental faculty, he fails to grasp the ultimate and exact values of things, either in quantity or quality. If he makes his observations correctly, his summarizing and calculations may be wrong, his equation may mislead him, and his results may be a fraction above or below the exact truth. Or his calculations may be right and his deductions be erroneous and misleading, and the final factor in the inception of a great truth thus escape him. From this his entire hypothesis of a science would be false, his theory of life a delusion, and the end disappointment and failure. In short, he may over-estimate or under-estimate numbers or values or dimensions or weight or time or space. And in fact all men do do this inasmuch as all men are imperfect.

Let us grasp this great truth, and it will help us then to cast the veil of charity over a weak and erring brother who does not agree with us, and who is, in consequence, so far from the truth. Let us candidly admit that we also may and do err just as surely as that he does,—in a different direction or proportion perhaps,—and that he can just as fairly impeach our motives or attainments. Let us be fair, for we all err together,—we all possess the unknown quantity affecting the accuracy of all our work.

In the science of biology there is much to be laid at the door of the personal equation. Even the best microscopists vary greatly in their observations and deductions, and lead us to the sage conclusion that "different men see things differently." It is not that any one is ignorant or unskilled or dishonest. It is that one observer sees things differently from others, or, if things appear the same, he puts different interpretations upon the appearances, or he draws different conclusions from similar interpretations, and he does all intelligently and conscientiously. But he unconsciously molds his conceptions so that he sees a different picture from others, and he cannot avoid doing so. It is his individuality, and to change that would be to give him a new mind, a new being, and make him a different man.

Many weary controversies have been imposed upon a long-suffering profession, which are occasioned by this innate variability of mental conception. Men will not admit, indeed they do not suspect, that all minds—their own included—are incomplete and imperfect, are in fact asymmetrical, and that the conceptions and the judgment must be warped, imperfect, and more or less wrong in all men. The inevitable inharmony leads to the tedious and uncompromising discussions which make the society proceedings and journals of the day a burden to the soul. And the worst of it is, that the lay element has become so exasperated by these fruitless discussions that they have lost faith in science to a perceptible extent, and there is prevalent a sort of scientific agnosticism. They doubt and doubt, for no common basis of belief is ever reached. For instance, take the one field of the development and physiology of the teeth. There is so much and so wide a variety of opinion that great doubt is abroad concerning all the accepted theories, and the intelligent layman is in the attitude of expecting the advent of a new hypothesis which shall better explain the phenomena of tooth evolution and structure. He is looking for a better principle than those conflicting ones offered by the controversialists of the day. This state of mind has been brought about by the bitter contests between the supporters of conflicting theories, who only succeed in destroying each other's hypothesis without establishing anything. The mind of man will more readily accept the ideas of destroyers than of constructors in ethics and science, and in this department the destroyer's work is so complete that laymen believe nothing. How much better to have acknowledged possible error in one's self, instead of accusing each other of it so persistently, and by casting an average have agreed upon a composite which would have been near enough the truth to have a real working value. Then would the extensive biological investigations of the day be of use to the profession, for a composite of conflicting theories is the safest path to follow. No extreme theory can ever be right.

Bacteriology is a field in which the personal equation will do some destructive work, if its votaries are not speedily brought to an appreciation of the power of this unknown quantity for error. In the myriads of germs to be studied, and the infinite opportunities afforded the perverted mind to err, it would almost seem that accuracy would be impossible. But if the proper check is put upon all work and the rule of averages prevail, safe composites of theories will be formed which can be depended upon as being more near the truth than any one man's work.

In the practical field of the profession we also witness the painful spectacle of intelligent and excellent practitioners contending over

petty theories or methods, each one so positive that all the truth is on his own side and all the error on the other! How much better to be charitable to our opponent and just to ourselves, if only for the sake of advancing truth. How much better to admit at once (as all men are bound to admit to themselves at least) that there is no such thing as perfection; that every man has his personal equation; that he must see and do things differently from others, and that men are not necessarily wrong when they differ from one another. We must force ourselves to acknowledge that we ourselves, as well as our opponent, are never entirely right. The fact of the matter is, that in practice the unknown quantity compromises every operation we perform. Perfection is unattainable so long as we are human. It does not matter how high claims may be made of success or what statistics may be brought forward, perfection, as popularly understood, is only provisional success at best. New processes and new theories of practice are continually arising which displace the old, and which may or may not render a greater percentage of success in practice. Yet conscientious practitioners have always served the public acceptably, in spite of the fact that all theories and methods have always been far short of perfection, and ever will be. The imperfection of humankind guarantees this for all time, and the progress of science can at best eliminate only the most gross errors, for the omnipresent personal equation will always retain the finer and imperceptible.

But to reverse the picture, we are consoled by the consideration that as regards both science and practice there is an element of safety, a saving grace, in the personal equation which makes it an advantage, and in the end really insures greater accuracy. This is found in the fact that each individual's tendency to error acts as a check upon that of every other individual, thus preventing each other from going too far toward any extreme and thereby creating the safe average, the composite, which is always the nearest the truth. In fact, the law of the composite is the fruit of the personal equation, and, per contra, error becomes the servant and surety of truth. Just as a composite picture exhibits the type of a family or a class, so the composite of many opinions or methods is the type of the whole mass. The extremes react upon each other and check and guard against being led astray by fanatics and vagarists, and the lines cross each other at the level of truth.

This is illustrated in the mathematics of engineers when casting the average. The observations or calculations of a number of individuals are added together and the sum divided by the number of observers to obtain the average. This average is the composite of all the individuals, and is the nearest approximation to the truth. This is the intra-compensation of error.

In science there is an unconscious check upon extreme opinion in the opposing opinions of others; but there is no systematic striking of the average in order to obtain the composite. If there were, there would be much more satisfaction to laymen. It would furnish an intelligent approximation to truth which could be depended upon and utilized. As it is, there is conflict and obscurity, and the practical value of most of the scientific discoveries and opinions of the day is almost nil. There is a prevalent distrust of theories and theorists, and between the investigators and the lay element there is a great gulf fixed. It has been created by lack of sympathy and confidence. There is an absence of harmony in investigations and deductions and theories for want of casting of the average, that is discouraging to honest seekers after truth. Human nature has been and is and always will be antithetical and divergent in thought and action. Unity on one plane or subject is impossible; or, if it were possible, it would be at the expense of truth. Without the check of opposite minds, a tendency in any one direction would become an impetuous and headlong rush to ruin. The disposition of men to see and do things differently has been a bulwark of safety for the human race in all ages. The blunders of one-man government, of unlimited monarchy, abundantly illustrate this. The best and freest government is that which has numbers of men associated together who may, by their varied minds, be checks upon each other. There is wisdom in a multitude of counselors. Through the errors due to the personal equation, men check each other that the truth may be more nearly attained. To err is to be human. To be perfect would be to be divine.

A recent writer (Mr. John Burroughs on "Matthew Arnold's Criticism") has mentioned a truth which in a measure accounts for the variety of the manifestations of mind in modern times. He says, "What distinguished the antique mind from the modern was its singleness and wholeness. It was not marked by the same specialization and development in particular lines. Our highly specialized and complex modern life leads to separatism,—to not only a division of labor, but almost to a division of the man himself. The classic mind was unity; the modern mind is diversity. Culture meant the perfect and equal development of the man on all sides." From the modern tendency to division arise those excessive growths in some directions and compensating deficiencies in others, which is the conspicuous quality of modern culture. Men are trained in particular directions and neglected and dwarfed in others. This leads to the heterogeneity in mass and asymmetry in the unit, which is characteristic of modern intellectual life.

Or again, according to M. Broca, Trousseau and others, this

mental asymmetry is disease; and for every mental deficiency there is a localized lesion or defect of the brain, and for extra mental power there is extra neural development.

Perhaps the most reasonable hypothesis in regard to the deficiency or excess of mental qualities is, that through inheritance certain faculties are stronger or weaker as they were exercised or neglected by some of our ancestors, be they immediate or remote. And as we are but the epitome of the experience of our ancestors, we inherit their impressions with irregular distinctness, and the preponderance of one or another is among the accidents that stamp our individuality.

But, be the cause what it may, all men, especially controversial members of the dental profession, should have regard for the eccentricities that are the common inheritance of all men, for all men are human, and to be human is to err. Let us say with Terence, "Homo sum; humani nil a me alienum puto," which Donner freely translates, "I am human; nothing that is human can I regard as alien to me."

POINTS IN THE ETIOLOGY OF PYORRHEA ALVEOLARIS.

BY J. D. PATTERSON, D.D.S., KANSAS CITY, MO.

(Read before the Joint Meeting of the American and Southern Dental Associations, at Louisville, Ky., August, 1888.)

SINCE reading an article before this body at its annual meeting in 1885, upon "The Catarrhal Nature of Pyorrhea Alveolaris," I have given close attention to the clinical study of the subject, as cases have appeared in my practice. The conclusions reached in the paper referred to have since then, for the most part, been confirmed by cases coming to my notice. The record of these additional cases has already been published and can be found in the "Annual of the Universal Medical Sciences," vol. iii, and the August number of the *Western Dental Journal*, vol. ii.

In again referring to the catarrhal nature of pyorrhea alveolaris, I will state that while I believe the disease is in every instance a true catarrh, yet I do not contend that the origin is always found in contagion from other catarrhal surfaces adjoining the oral cavity. My experience has taught me how rarely we find a considerable catarrhal condition in either the oral cavity, the nasal passages, or the pharyngeal tract, without that condition extending to all of them in a greater or less degree, and yet we may have pyorrhea of the oral cavity—or, as I consider it, a catarrh—without that condition in either of the other tracts. In my experience, however, this is unusual. But we must not argue that pyorrhea is not of a

catarrhal nature because we see no point from which the contagion comes. As well, in my opinion, might we argue that no nasal catarrh exists because we cannot see a point from which the nasal passages have received infection. Catarrh has, as I believe, its original seat in the oral cavity through much the same influences that cause it upon other mucous surfaces. Indeed, if the mouth is used for breathing, the mucous surface there is upon strict analogy more liable to catarrh than even the nose, which is its classic seat, for, in addition to the shock from colds, changes in air temperature, dust particles, etc., which cause nasal catarrh, we have here influences potent for the destruction of the functional activity of the oral mucous membrane, which are not met with in the nasal cavity. There are here the irritations of abnormal stomachic conditions, we find uncleanliness sufficient to poison the whole system, we find the irritation from morbid oral secretions, of salivary calculi, of artificial plates, diseased teeth with decayed and jagged edges, et cetera, and is it then a matter of surprise that catarrh should attack the oral mucous membrane?

In the pharyngeal vault there is found a bursa, the "bursa pharyngea," a depression in the mucous membrane which is commonly believed to be the seat of post-nasal catarrh owing to the facility with which irritant matter settles there and becomes the seat of trouble. In the mouth every tooth with its gum presents a bursa which also may and does afford lodgment for foreign matter to remain and irritate until the mucous membrane, peculiarly sensitive at this point, weeps out its protest and a true catarrh is soon in full sway.

I am firmly of the opinion, which has been confirmed again and again, that pyorrhea, or catarrh of the oral cavity, exhibits its true and characteristic symptoms when the exciting causes are varied,—*i.e.*, a true pyorrhea is not the result of one kind of irritation or cause, such, for example, as a particular constitutional condition or tendency, or idiosyncrasy, or local condition or irritation, but that its characteristic pathology may be and is exhibited when the original cause may be either local or systemic, simple or complex. I have had in my practice as well-marked pyorrhea, with pockets, and pus oozing upon pressure, upon the palatal surfaces of teeth from the irritation produced by a constantly worn and carelessly cleaned partial plate, as I have ever seen produced by causes more obscure or systemic; the only point of difference being that the disease was confined to the palatal surfaces pressed upon by the plate. The claim therefore sometimes made that true pyorrhea is totally different from the gum irritation found in local irritation is not, I think, well taken. The disease, therefore, whether from local cause or

constitutional tendency or dyscrasia, merges into the same pathological changes, exhibiting in its later stages the same destruction of tissue and calcareous deposits; just as catarrh of the nose, whether from systemic or local causes, will finally cause the same pathological changes, hypertrophy of tissue, destruction of bone, and deposits of calcareous matter.

In complications of catarrh we find that a "vicious circle" is established. I quote from "Ziemssen's Encyclopedia," vol. iv, p. 141. "The fluids retained may throw down chalky deposits and thus form stony concretions;" "hyperplasia of the membranes may lead to actual new formations and polypoid excrescences;" "'a vicious circle' is established: all these processes being able to induce chronic rhinitis, *and being in turn produced and maintained by that disease.* Chronic catarrh may also involve neighboring parts. It may extend posteriorly into the pharynx, or anteriorly into the epidermis. *The cavities adjacent to the nose may also be attacked.*" "The most familiar are the processes that take place in the cavity of the upper jaw, which may thereby be distended, and present the affection known as '*Hydrops Antri Highmori.*' In this way caries of the bones may ensue, even of those belonging to neighboring cavities and entering into the formation of the base of the cranium. The inflammation is more likely, however, to spread to the skin surrounding the nostrils. This becomes infiltrated and swells, while excoriations of the upper lip and swelling of the glands of the neck combine to present a picture of 'the scrofulous habitus' as taught in the books." I also quote from Cohen on "Diseases of the Throat and Nose," in regard to calculi in nasal catarrh, as follows: "Calculi, as before mentioned, are occasionally met with in the nasal passages. They are due sometimes to a foreign body which has been forced into the nose and eventually becomes converted into a nucleus for the deposit of calcareous matter; in other cases they have been found to be due to a deposit of the inspissated mucus or sanguinolent secretions from the inflamed mucous membrane."

I make these quotations to bring additional testimony to my claim made in my first article before this body as to the identity of the calcareous accretions found in nasal catarrh and pyorrhea alveolaris. In the light of recent study upon the subject I cannot account for the opinions of some well known dental writers as to the origin of the deposit found well up on the roots of the teeth affected by this disease. Now, as a matter of fact, all prominent pathologists agree that accretions may make their appearance as a deposit from purulent matter from inflamed territory *in any part of the human body.* Upon this subject I desire to quote, in proof of this statement, from the recently issued "Hand-Book of the Medical

Sciences," vol. i, p. 743. "Calcification consists in the abnormal deposit of earthy matter in or around the elements of a tissue, or *in the morbid product of a pre-existing inflammatory process.*" "The circulation of the blood may be retarded and thus favor the precipitation of the calcareous matter which it normally holds in solution." "Calcification rarely if ever depends solely upon general causes; there is always a local influence, very often it is due to a pre-existing chronic inflammation. Old accumulations of pus, extravasations and exudations, are exceedingly prone to calcification." "*A mere loss of function predisposes to calcification.*" With regard to the immediate nature of the process involved in the deposit of lime-salts there is some difference of opinion. The simplest mode of explanation is as follows: "A certain amount of calcareous matter is a normal constituent of the blood, in which it is held in solution by the carbonic acid always present in sufficient quantity to keep in solution twice the normal amount of earthy matter. When the circulation is impeded, the carbonic acid, because of its great diffusibility, is readily absorbed by the tissues or goes to form new compounds, necessitating a precipitation of the calcareous matter. *This is likely to occur in all tissues of the body.*"

With these facts before us, does the presence of lime-deposits in the pockets of pyorrhea alveolaris still surprise us, and must we yet indulge in vague surmises over its presence?

To my mind the other pathological symptoms in nasal catarrh and pyorrhea are as clearly noticeable and identical as are the deposits in both diseases. In the oral cavity the deposit is more frequent and is seen earlier than in nasal catarrh only because the anatomical structure in the mouth affords readier points for its seclusion and aggregation. As I have before considered before this body the identity of other pathologies met with in these diseases, I will not here go into that subject.

Of interest in this connection is a report of the recent meeting of the American Otological Society. In a discussion upon the "reflex influences in the production of naso-pharyngeal catarrh," Dr. A. H. Buck, of New York, said, "The object of my paper was to call attention to those comparatively remote exciting causes of naso-pharyngeal catarrh which act, so far as it is possible to explain their mechanism, through the intervention of the nerve system. We know little of the direct exciting causes of naso-pharyngeal catarrh. The most common indirect cause is chilling of the surface of the body. *According to certain authority, affections of the teeth should rank next in order of frequency.*" Dr. Samuel Sexton also said, "*I have seen many cases in which irritation in the mouth has been the cause of naso-pharyngeal catarrh and aural symptoms.*"

To me these remarks pointing to irritation in the mouth as a cause of catarrh in the nose and pharynx point the dental profession also to another thing, and that is, that if we are slow to admit of catarrh in the oral cavity, we will soon be compelled to do so by weight of testimony from the medical profession. The irritation these men speak of could scarcely be attributed to transient dental lesions, but rather to the prolonged irritation and contamination from pyorrhea alveolaris.

As additional evidence upon the question, I have now to point you to the usual presence of pyorrhea and catarrh of the nose in persons having cleft palate. About one year and a half ago, a patient wearing an artificial obturator of Dr. Kingsley's was sent to me to have the broken plate repaired. In working over the case I quickly observed the presence of fetid chronic catarrh of the nasal passages, and also pyorrhea alveolaris in the mouth in its advanced stages. The patients for whom I had in past years made artificial vela may or may not have been afflicted in the same way,—my attention had not then been directed to the study of pyorrhea,—but since observing the marked case to which I have referred I have examined three other cases of congenital cleft palate, and in two found both pyorrhea and naso-pharyngeal catarrh. The third patient was without any teeth. I think it not unlikely that in these cases, where function is so largely destroyed and where so often a dyscrasia exists, catarrh will generally be found present. This can be proved or disproved by a continued record of such cases. It could scarcely be expected, however, that catarrh in these cases could be present in the cavity of the nose or of the mouth without being present in both, the facility for contamination being so largely increased through the opening of the cleft.

To the theory of oral catarrh the objection has been raised that when the affected teeth are lost by extraction or drop out through destruction of their sockets, the disease will thereupon rapidly disappear; and it is argued that were it catarrhal it would continue. I answer, that were it not for the peculiarly favorable conditions made by the presence of the teeth catarrh would not be possible. But the many depressions existing at the gum edge around the teeth, which are often augmented by neglect and accident, afford just the opportunity for the origin of catarrhal symptoms; they are the bursæ corresponding to the depressions in the nasal mucous membrane which there give catarrh its seat. When the teeth are gone the diseased places are soon drained and obliterated, and the mouth then presents a dense mucous membrane which is being constantly cleansed, and the presence of catarrh is rendered impossible.

Were the nasal passages as readily cleansed as the mouth without teeth, and the membrane as insensible to irritation, then, I apprehend, no nasal catarrh could exist.

In regard to the question of whether pyorrhea is of constitutional or local origin, the opinion of the writer has been foreshadowed in the foregoing remarks. I believe that a true pyorrhea is catarrhal, and like catarrh of all mucous surfaces the causes may be both systemic and local, or they may be entirely local. I believe that the common cause of pyorrhea is found in local irritation, frequently combined with some predisposition which may be either hereditary or acquired, and which lends to the virulence of the symptoms just in proportion to the loss of function or weakening of function produced by that predisposition, but that pyorrhea is seldom, if ever, the result of systemic causes alone; while, on the other hand, local irritation is unquestionably often the only factor in the origin and maintenance of the disease.

DENTAL IMPLANTATION.

BY H. A. SMITH, D.D.S., CINCINNATI, OHIO.

(Read before the Joint Meeting of the American and Southern Dental Associations, at Louisville, Ky., August, 1888.)

SINCE Dr. Wm. J. Younger published his brochure in 1886, the operation of dental implantation has greatly attracted the attention of the dental profession.

While many dentists still regard the operation in the light of a scientific experiment only, others now thoroughly believe in its practicability and predict for it a future of great usefulness.

With the view of obtaining more exact information regarding implantation, the chairman of Section VI of the American Dental Association recently addressed a circular letter to dentists, asking for particulars, first, as to their percentage of success and failure, second, as to the causes of failure, third, as to the manner of attachment, and fourth, as to a possible change of color in the implanted tooth.

Judging from the correspondence which has resulted, we may conclude that dental implantation is not being generally practiced, since but a small number of those addressed had actually performed the operation.

In presenting the subject, we have confined ourselves to the data and observations furnished by those who have had actual experience in the operation; and though many of the observations of those who have not implanted are both valuable and interesting, to embody them in this paper would defeat the intention to be brief.

These data we have tabulated in order to show, first, the percent-

age of success attained by each operator and from this the average percentage, and second, the different opinions held upon the questions of attachment, color, and cause of failure.

I regret that I am unable to give the total number of cases which this table represents.

			a. Causes of Failure.			*b.* Assumption of Color of Natural Teeth.			*c.* Manner of Attachment.		
	Per Cent. of Successes.	Per Cent. of Failures.	Absorption of the Root.	Unfavorable Conditions.	Accidental Causes.	Do Assume Color of Natural Teeth.	Approximately.	Do not.	Vital or Membraneous.	Anchylosis.	Mechanical.
Geo. Cunningham, England	100	0									X
Wm. J. Younger	90	10		X	X		X		X		
L. L. Dunbar	75	25		X		X					X
G. L. Curtis	99	1		X		X	X			X	
H. C. Herring	90	10	X		X			X			
Louis Ottofy	86	14		X	X	X			X		
W. W. Morrison	95	5	X				X		X		
E. C. Kirk	94	6	X			X				X	
W. H. Rollins	100	0						X			
E. T. Darby	100	0				X				X	
M. H. Fletcher	80	20			X		X		X		
Thos. Fillebrown	75	25		X			X				X
J. G. Harper	80	20		X		X					X
L. E. Custer	100	0									X
E. S. Chisholm	33	67		X			X			X	
B. A. R. Ottolengui	93	7		X			X				
J. W. Griffith	60	40			X	X					
Average per cent	85	15									

The sign X denotes the opinion of the several operators as to the problems suggested by the headings *a*, *b*, *c*, and their sub-divisions.

Dr. George Cunningham, of England, reports seven cases of implantation, all successful. He says that he has thus far used only freshly-extracted teeth, and believes that if a tooth is implanted before the death of the organic parts more immediately concerned [the pericementum and cementum] the prospect of union is increased and the loss by absorption decreased.

The theory as to the persistent vitality of the pericementum of dry teeth, he remarks, has no scientific basis and is totally at variance with our knowledge of physiology; therefore, he concludes that Dr. Younger's earlier method of practice was better than his present method.

Dr. B. A. R. Ottolengui, of New York, says the best teeth for implantation are those from healthy young people; and when extracted, they should at once be placed in a solution to be kept moist. He says also that teeth which show absorption of the root,

recession of the gum, injury to the cementum by the forceps in extracting, erosion, or teeth dried until they are friable, should not be used.

Dr. W. H. Rollins, of Boston, says, "I regard the operation as valuable; but the chief difficulty is, to get teeth which I feel sure are from the mouths of healthy persons. I have implanted only fresh teeth, because I consider their use more likely to result in success."

Dr. H. C. Herring, of North Carolina, on the contrary, reports a case in which he implanted in the mouth of a negro seventy-two years old a tooth that had been extracted seventeen years, and the operation was successful.

It appears, then, that we are in need of observations carefully made upon the relative results obtained with fresh and dried teeth. If we are to use only freshly-extracted teeth, the practicability of implantation will, of course, be somewhat limited.

To the question, Do implanted teeth assume the color of the natural teeth in the mouth in which they are implanted, most correspondents have answered that they do approximately. Dr. Younger remarks that they do, if the scion tooth is not too dark or too blue.

Dr. Cunningham says that the fresh teeth implanted by him had never lost their natural color, therefore there was none to resume; but he does not say whether they afterwards assumed another color or not.

We find that dried teeth (if not stained before extraction) are notably lighter and more uniform in color than the same teeth would be in the mouth.

When living teeth are kept dry for an hour or more, during our operations upon them we notice a gradual change in color: they become perceptibly lighter, and their natural color is resumed when again bathed in the saliva. Would this fact indicate that a dried tooth when implanted will, after absorbing the fluids, assume the color peculiar to the other teeth in that mouth? The previous color of the implanted tooth, as well as variations in density, would no doubt modify the result.

Dr. Ottolengui mentions a case in which a blue-white tooth was implanted among yellow teeth, and after six months the scion tooth still retained its original color.

As to the mode of attachment, the correspondence seems to indicate that the question is far from settled in the minds of the profession.

A most important contribution bearing upon the question is a report made in January last, by Drs. Heitzmann and Bödecker, en-

titled, "Microscopical Examination of an Implanted Tooth, extracted from the Mouth of Wm. J. Younger." The tooth had been worn for six months, and practically, at least, was a successful case.

Sections were made from opposite sides of the root. An examination of sections from one side showed the cementum to be intact, and the surface appeared jagged and showed crevices, and there was no trace of the original pericementum. Sections from the other side showed only traces of cementum. The exposed dentine was corroded and pierced by numerous bay-like excavations, resembling the root of a temporary tooth in the process of shedding. The bays were filled with granular protoplasm or giant cells, and in some places bundles of fibrous connective tissue entered the bays in the dentine.

At one point even a small piece of bone-tissue was seen, which was identical with that which is observed during the process of absorption of the temporary teeth.

The granulation-tissue observed, penetrating the cementum and dentine, arose from the newly-exposed alveolus, and entering the bays, as it does, effects an attachment which sufficiently explains the firmness of implanted teeth. These observers deny that in this tooth a living union had occurred between the granulation-tissue of the jaw and the cementum and dentine of the implanted tooth. No revivification of the tissues of the implanted tooth had occurred, yet they think that the chances of success are much better in implantation than in either replantation or transplantation, because of the new and healthy socket.

At a recent meeting of the First District Dental Society of the State of New York, Dr. G. L. Curtis read a paper on the "Microscopical Examination of an Implanted Tooth." In the preparation of the sections and drawings which were shown, Dr. Curtis was assisted by W. M. Gray, M.D., Microscopist to the Army Medical Museum of the United States. The tooth examined was a bicuspid which was freshly extracted at the time of implantation. It had been in use nine months without inconvenience, and, owing to the firm attachment, the root was broken in extraction. After a description of five sections, Dr. Curtis says, "I believe the fixation of the root was caused by a reproduction of the bone-tissue of the alveolus."

The inflammation consequent to the formation of a socket produced an infiltration of osteoblasts or bone-corpuscles in the cement-substance, and the outcome of this process was bony anchylosis. He believes the whole tooth was revitalized.

Dr. E. C. Kirk, of Philadelphia, who reports thirty successful cases out of thirty-three, thinks the attachment that of bony anchylosis or

direct union with the alveolus, without intervening membrane. This condition, he says, is manifested by percussing the implanted tooth with a steel instrument, when a peculiar resonance distinctly different from other teeth is produced.

As another evidence of attachment by anchylosis he mentions that in all cases, with two exceptions, the teeth were free from the slight mobility common to normal teeth. Dr. L. E. Custer, of Ohio, also mentions this complete immobility of implanted teeth, yet he believes that no true union ever takes place between cementum and bone, however nearly identical these structures may be.

It will be seen, then, that three modes of attachment include all the opinions reported upon this point, namely: A vital union between the revived pericementum and neighboring tissues; a bony anchylosis; and a mechanical attachment.

The true mode of attachment can be ascertained only by careful microscopical examinations of sections cut through the jaw and implanted tooth in position; and we have reason to believe that such experiments are now being made upon the lower animals and will greatly enlighten us upon this question.

In regard to the percentage and causes of failure, the reports have shown an average of about fifteen per cent. of non-successful cases. Dr. Younger's report corresponds nearly with this, being one failure in ten. He mentions three causes of failure: Unhealthy condition of surrounding tissue, lack of sufficient pericementum on roots, and want of care in keeping the teeth rigid in position. He does not mention absorption of the roots as a cause of failure, yet it is commonly the opinion of those who implant and transplant teeth that they will finally be lost by absorption.

Except Dr. Younger's, in a majority of the cases reported the teeth have not, perhaps, been implanted long enough to show signs of absorption, hence the causes given are other than those of absorption of the roots. Dr. Younger states that all of his failures have occurred within a year, usually within three months after the teeth were inserted.

Dr. Morrison, who reports five per cent. of failures from absorption, says that he invariably retains the scion tooth immovable in a rubber splint securely attached to neighboring teeth. This splint, he says, should be worn a month at least, and he insists further upon perfect cleanliness.

The standard for a successful case of implantation is not satisfactorily fixed. Whether the teeth now implanted and regarded as useful will remain so for a length of time sufficient to justify the pain and slight risk of infection attending the operation, remains to be seen. A person who has had a tooth implanted says that he

would prefer to have the operation repeated each year, rather than be compelled to again wear his plate.

It has been shown that replanted and transplanted teeth are short-lived. May we not hope for better results with implantation?

Time must answer the question.

THE APICAL PORTION OF THE CEMENTUM PHYSIOLOGICALLY AND PATHOLOGICALLY CONSIDERED.

BY I. P. WILSON, BURLINGTON, IOWA.

(Read before the Joint Meeting of the American and Southern Dental Associations, Louisville, Ky., August 29, 1888.)

When we examine the apical portion of the cementum with the microscope we find that it communicates directly with the pulp of the tooth, having but little, if any, communication with the dentine, as does the greater portion of this structure. We find, also, that this material is thicker and more vascular at the apex than at any other point of its incrustation of the root. Its lacunæ are larger and more numerous, and their canaliculi reach out to the alveolo-dental membrane on the one side, and to the pulp on the other, thereby bringing that organ in direct relation, through the vessels of the cementum, with the root-membrane. We also find, occasionally, Haversian canals in cementum at this point, especially in hypertrophied roots. The more abundant the cementum, the greater the supply of its nutrient vessels.

In pulpless teeth the peridental membrane and the cementum doubtless receive an increased supply of nutrient material; the blood-supply to the pulp having been cut off is now poured into the root-membrane, increasing its vascularity and enriching its vessels. This increased activity of the membrane doubtless accounts for the increase of nutrient material deposited around the roots of such teeth. It follows, then, that if the function of the membrane is increased to build up tissue, it is also increased in its power to tear down and carry away tissue, as in absorption, to be referred to farther on.

I need only hint at the physiological relations of the apices of the roots with the surrounding tissues, and will pass at once to consider the main point of interest to which I desire to call the attention of the profession.

The devitalization of the dental pulp should not, and usually does not, interfere with the vitality of the cementum; but from observations I have made from time to time, I am led to believe that the life of the apical portion of the cementum, or that part not separated

from the pulp by dentine, is sometimes destroyed with the pulp, resulting in necrosis, and ultimately in absorption or the solution of the lime-salts of the tissue of the end of the roots. We will almost always find this to be true in those cases where the canals have been filled for a considerable length of time, and yet there has continued to be a tenderness on percussion, and indeed the tooth will remain slightly sore the greater part of the time, but the sensitiveness experienced is that of *uneasiness* rather than real pain. This state of affairs is brought about by one of two causes: either the canal has not been filled perfectly to the apex, or the devitalizing effects of arsenic have been communicated through the canaliculi to the lacunæ, thereby leaving this portion of the cementum dead and inert. Here, then, is foreign matter for nature in some way to dispose of, and she sets about her tedious task in her own way, and persistently carries on the process until the work of the solution of the lime-salts of the foreign substance is accomplished.

But it may be asked that if an implanted tooth will become firm and free from soreness, and remain serviceable an indefinite length of time, when it is in every sense a foreign body, why may not a root with only its apex necrosed become equally firm and free from soreness and disintegration. For the same reason, I would answer, that an *implanted* tooth will become firmer and freer from soreness than a *transplanted* one. The one is surrounded by peridental membrane, the other is not; the one is held strictly by gomphosis, the other being cushioned by the membrane is somewhat movable. And again, a periosteal structure cannot become attached to or united with a foreign substance, but will exercise its function to the extent of its power to break down and carry away the extraneous matter.

If I am correct in my theory, it becomes a matter of the utmost importance that arsenic be employed with the greatest precaution, that the vitality of the cementum, so intimately associated with the pulp at this point, be not destroyed. When the first application fails to accomplish its work thoroughly, it is, in my opinion, dangerous practice to make a second or a third application.

I am not prepared to do away with the use of this drug altogether, as have some of our best practitioners, but I believe that many of those incurable cases of alveolar abscess are the result of arsenious poisoning.

If I have succeeded in this short paper in calling the attention of the profession, and especially microscopists, to the pathological conditions peculiar to the apical portion of the cementum that will lead us to safer and more successful practice, I have accomplished my purpose.

PROCEEDINGS OF DENTAL SOCIETIES.

JOINT MEETING OF THE AMERICAN AND SOUTHERN DENTAL ASSOCIATIONS.

(Continued from page 752.)

SECOND DAY—*Evening Session.*

THE joint meeting convened at the usual hour. Dr. Abbott in the chair.

The subject of Operative Dentistry was passed and the Committee on Histology and Microscopy called.

Dr. Abbott called Dr. Patterson to the chair while he read the report of the committee, which presented two papers, by Drs. I. P. Wilson and Frank Abbott respectively. Dr. Abbott then resumed the chair, and Dr. I. P. Wilson, Burlington, Iowa, read his paper, which was entitled "The Apical Portion of the Cementum Physiologically and Pathologically Considered." [This paper will be found at page 808, current issue of the DENTAL COSMOS.]

Dr. W. H. Atkinson was sorry there were not twenty to jump to their feet when such a paper was offered. It bears closely on the occult movements of pabulum in nutrient and denutrient activity, and enforces what the speaker has been trying to say when he has advocated burring out around the apical foramen. When Dr. James W. White was preparing his "Dental Materia Medica," he had asked him not to put arsenic in it, but he did put it in. Here is a man who says he can't get away from the use of arsenic, but who is beginning to be afraid of it. He speaks nicely about the anatomy of the part. When we have reproduction of a part some portion of the territory involved must go into retrogressive metamorphosis to give the gluey basis-substance. We do not yet understand the inflammatory process involved in the building up of the tissue. How does arsenious acid act? Nobody knows, and nobody cares, except in the mass way. Affinities exist between the arsenious acid and the fluid portions of the pulps of teeth, and just how the arsenious acid will act depends upon how much of it is there. If there is just the right quantity to form an arseniate, you have the best filling that can be put into the tooth. He has a strong conviction that there is a microbe that has to enter to cause the destruction which is found so often at the ends of pulpless teeth. How often in such cases after the tooth is extracted does the dentist examine it, and, whenever the point of the root is found roughened, exclaim, "O yes, I was just right in pulling it." Whereas he was just wrong. If he had burred

it out through the gum, and even washed it with salt and water and held his finger over it until a clot was formed, the trouble would have been ended.

Dr. John C. Storey, Dallas, Texas, wished Dr. Atkinson would tell us just how to do the right thing in these cases. He has told us of our sins,—sins which are committed every day,—but he does not tell how to avoid this trouble except in a single tooth. What is to be done with the teeth with aching nerves that will not be quieted? He (Dr. Storey) had been trying for more than twenty years to find a better way than the use of arsenic, but without success.

Dr. Atkinson replied that he had told his method of treating pericementitis so often that he had thought there was not a man practicing dentistry who did not know it. If the tooth is tender and a little pressure comforts it, it may be ligatured so as to produce pressure. To relieve the inflammation cut through the mucous membrane, gum, periosteum, bone, and pericementum, and well into the cementum, using a sharp knife and making the slit in the gum long enough to prevent the formation of a sac; but be careful not to cut the margin of the gum or pericementum. There is a whole field of remedies to be used, and it is well to use whatever will comfort the inflammation. If hot applications give the greatest comfort, use hot; if cold, use cold; but as you love the truth, don't use warm applications.

Dr. Abbott called Dr. C. R. Butler to the chair, and read a paper entitled, "Odontoblasts in their Relation to Developing Dentine." [See page 773, current number of the DENTAL COSMOS.]

Dr. W. Xavier Sudduth, Philadelphia, considered the subject of vital importance to the dental profession. That the views put forth in one portion of the paper are new goes without dispute; that they are not generally accepted by histologists also goes without dispute. Dr. Abbott holds that all the hard tissues of the body go through a process of transformation of their basis-substance, which is then calcified by infiltration with lime-salts rather than by secretion. The speaker has held, from his studies, that the calcification of the hard tissues is a process of secretion. In bone the number of cells is more limited in the cortical portion than in the cancellous portion. The difference between these two kinds of bony structure is a difference in the manner of secretion. In cancellous bone each cell is laid down by itself, but in the cortical structure they are secreted in layers. The regularity with which bone is secreted shows that there is a power behind, something which directs the formation of this portion. So with dentine there is a directing agency which controls the deposition or secretion of the lime-salts. In cartilaginous ossification we do not find development of bone until the capillary vessels have penetrated into the cartilage.

Following this we have an exudation of white blood-corpuscles and a development of the cells which govern the secretion of the bone. In following out the line of work done by Drs. Abbott, Bödecker, and Heitzmann, he had noticed that they had almost altogether ignored the nuclear structure of tissue. The line of demarkation between the odontoblasts and the calcified structure is well marked. The odontoblasts vary in shape. The form is dependent upon the pressure of fellow-cells. The odontoblastic layer is the most marked example of this variation in form, the cells being columnar, spherical, or dumb-bell-shaped in many instances. In all these cells there is a nucleus at the distal end, that is, farthest from the point where the calcification is going on. He was not surprised that Drs. Heitzmann, Bödecker, and Abbott were misled on this point, when he recalled the specimens shown him in Dr. Heitzmann's laboratory. They showed nothing of the finer structure of the tissues, and gave nothing, in his opinion, from which positive conclusions could be drawn. In staining tissues their structure is not destroyed, but the details are brought out through chemical reaction upon the staining agent. The term "return to embryonal condition" has been used in describing the changes in the tissues. They are all the time in an embryonal condition in fetal specimens. Dr. Heitzmann had told him he had never studied the secretion of shell. Here is one of the best illustrations of the method of secretion. The entire shell is developed in the same way as the cortical portion of bone. At the meeting in Boston some slides of decayed dentine by Dr. Miller were shown, in which the dark territories Dr. Abbott speaks of as embryonal corpuscles were clearly seen by the photo-micrographs to be filled with masses of the bacilli which caused the decay.

Dr. Abbott. If we did not differ from one another we would never learn anything. Notwithstanding different men may look at the same specimen through the same glass, each will see it in a different way. No two persons see the same thing in exactly the same way, and they therefore draw different conclusions from it. The subject of the difference between the theory of transformation and that of secretion is old. He had never been able to decide positively upon the truth of the secretion theory, and therefore he could not speak so emphatically as Dr. Sudduth. Theories of the production of dentine contemplate the formation of a row of odontoblasts at the periphery of the papilla, the distal ends of which are in conjunction with the ameloblasts, which are to form the enamel. That is where calcification begins. The secretion theory as applied to dentine seems to contemplate the secretion of lime-salts and all other substances to form the dentine, by this row of odontoblasts, which then fall back and are found around the pulp in a dense,

small form. As stated in the paper, Kölliker in 1852 concluded that this could not be so, that the nucleus splits up, by which means the odontoblasts are lengthened, calcification going on from without inward. Goodsir says that the odontoblasts individually become calcified, but this view has been denied by many. It was remarked by Dr. Sudduth that the nucleus is always at the distal end of the odontoblast, and is not to be seen anywhere else. With a high power we can discover a reticulum in the odontoblast, and that reticulum has in it a mass of granules, or little nuclei. All that is required is simply magnifying power enough to see them. The distal end of the odontoblast breaks up into the embryonal condition, the formation of the odontoblast having been merely a provisional step in the formation of dentine, and the formation of dentine proceeds from these. Dr. Sudduth was more fortunate than the speaker in being at the Boston meeting, where he saw the beautiful specimens from Berlin. What are the facts about every specimen shown with reference to decay of dentine, whether prepared in this country or in Europe? That there is a layer of tissue between the territory inhabited by the micro-organisms and the perfect dentine, the presence of which cannot be explained except upon the reaction theory. First there is the débris, than a layer of carious substance which is extremely soft, and which is filled with micro-organisms, principally micrococci and leptothrix. A little deeper along the canaliculi there are little bits of granular masses, which the staining process shows to be micro-organisms. Then there is found running off into the dentine a yellow stain,—a layer of broken-down tissue. There are no organisms present here, it is simply broken-down or imperfectly formed dentine. If the dentine is a living tissue and is not subject to inflammation, and will not respond to irritation, what will it do? He claims that this disintegrated tissue, beyond the point where the organisms are found, is the result of a disturbance of the formed condition of the lime-salts caused by the inflammatory reaction produced in the tissue by the irritation from the cavity. Some of this may be due to the organisms, but he does not believe that the organisms cause decay; they are there because of the decay. He does not believe that in the extreme depth of the decay an organism can be found; at least, he has never seen it.

Dr. Sudduth. No theory that was ever advanced can explain the production of cavities in teeth except the germ theory,—not even the acid theory alone. Lactic acid, it has been proved, takes out the lime-salts, and the digestive ferment, which the micro-organisms form, breaks down the basis-substance and forms the cavity. The lime-salts may be removed from a tooth out of the mouth by acid, and the basis-substance is still left which gives form to the tooth,

and in so pliable a state that it may be tied in a knot. Dr. Miller, who discovered the real agent in the production of decay, stands preeminent in this department of histological investigation.

Dr. Abbott. In regard to the production of acids by the micro-organisms, and the statement that teeth never decay but by the agency of micro-organisms, it must be remembered that there is something else besides lime-salts in the structure of a tooth. What becomes of this other portion in the process of decay? How is it possible that living tissue shall all vanish without the slightest irritation? What is known as "leathery" decay is full of organisms, but the animal structure is still there. Take a layer of dentine immediately under the actual decay and it is a little harder; there are some lime-salts, but the organisms are fewer. A little deeper the dentine is harder still, because there are more lime-salts and there are still fewer organisms. And so on until just before reaching the sound dentine there is nearly the normal amount of lime-salts and no organisms; but it is broken down by some agency,—it may be by micro-organisms, or by acids, or by something else. Whether micro-organisms are to blame for the condition is of very little moment to us practically. If we go deeper down to the boundary line between the perfect dentine and that which is only partially disorganized, no organisms are found, and the lime-salts are all there. If the teeth are kept perfectly clean there will be no decay. There may be organisms upon them, but they will not cause decay. Microbes are found everywhere, in the air, in food, in water, but they do not destroy us because the conditions are not favorable for their development.

Dr. Sudduth. How is the cavity produced?

Dr. Abbott. No cavity can be produced unless some acid is first formed. Fermentation of food produces it; and it finds a favorable place to work in the sulci of the enamel, through which it works its way, when it comes to a tissue which is largely living, in which it produces an irritation, through which the lime-salts are displaced, and there is a melting down, through the inflammatory process, of the organic tissues. As the lime-salts are displaced, the acid dissolves and carries it away. There is something at work besides organisms, and we have denominated the process an inflammation. The irritation set up by this process goes much deeper into the dentine than the organisms penetrate, and the dentine is consequently broken down. The tissue is taken away the same as any other dead tissue, by decomposition, which process is always marked by the presence of organisms.

Dr. Sudduth. That answer admits the proposition. It has been proved that nothing but digestive fermentation will cause this breaking-down of the basis-substance, and that the active agent in

the removal of the lime-salts is the same acid as is found in sour milk, lactic acid.

Dr. Abbott denied that he had made any such admission as Dr. Sudduth claimed.

Dr. W. W. Allport, Chicago. A few years ago Dr. Bödecker read a paper before the American Dental Association detailing the results of some experiments in placing arsenious acid in contact with the dentine, which was thereby wasted away along the tubuli to the pulp. How could this occur when there were no microbes there? Evidently it must have been by inflammation caused by the arsenic.

The subject was passed.

Adjourned till Thursday morning at 9.30.

Third Day—*Morning Session.*

The joint session convened as per adjournment.

President Catching in the chair.

The committee on Materia Medica and Therapeutics was called, and Dr. John C. Storey, Dallas, Texas, presented a brief report, an abstract of which follows:

Dr. Storey's report detailed in a humorous manner the difficulties he had experienced in procuring papers to be read before the joint convention on the subjects embraced in his committee, and closed by presenting a case of cocaïne poisoning as reported to him. The dentist had made several unsuccessful attempts to extract the right second inferior molar, having broken the crown off across the pulp-chamber just below the free edge of the gum. To alleviate the pain cocaïne hydrate 7 grains, chloral hydrate 5 grains, carbolic acid 2 minims, and soft water 2 drachms, was used as a local anesthetic, the gums being moistened freely with the combination. Three applications were made and three swallows of brandy were taken in about five minutes. At the seventh trial with the forceps the patient felt a peculiar stiffening sensation of the joints of the fingers, which extended rapidly to the elbows and shoulders, and on arising from the chair fell insensible to the floor, remaining unconscious about five hours. Consciousness was regained about eleven o'clock P.M., "the remainder of that awful night" being passed, in the words of the patient, "in a manner which I shall never be able to describe." In the beginning several physicans were called and various antidotes were administered,—tartar emetic, mustard, hot salty water, and coffee. At six o'clock the next morning the patient's arms from elbows to wrists were almost a solid mass of pimples containing pure pus. At the end of three days these turned into little boils, which continued for about five days longer. Patient afterward reported no unfavorable constitutional effects.

Dr. A. W. Harlan, Chicago, read a paper prepared by Dr. Arthur C. Hugenschmidt, of Paris, "On the Hypodermic Use of Muriate of Cocaïne in Oral and Dental Surgery."

Dr. Hugenschmidt's paper gave the results of his experience in more than two hundred hypodermic injections of cocaïne for the production of local anesthesia. His first use of it was for the removal of a portion of necrosed bone from the outer plate of the alveolar process of the superior maxillary. The operation was performed painlessly. In extraction his earlier experiences with cocaïne were unsatisfactory, owing probably to the bad quality of the drug used. He now uses it nearly every day, sometimes several times a day; and having uniformly satisfactory results, he had ceased to keep a record of cases after passing the one hundred and fiftieth. A number of the injections were made under the direction of his preceptor, Dr. Thomas W. Evans, who had also used the method. As an interesting bit of information, he stated that Dr. Evans, who had for many years attended the late Emperor Frederick, of Germany, last fall extracted a badly diseased left inferior second molar for his imperial patient, scraped the socket, and made an exploration of the surrounding parts which communicated with the socket by fistulous tracks, all of which was done without causing pain, after injecting a half-grain of cocaïne. He added that Dr. Evans had always considered this tooth one of the primary causes of the emperor's illness.

Dr. Hugenschmidt claimed that he had had only one local and three general accidents in his use of cocaïne, and five persons felt slightly certain unpleasant effects of the drug. He had also used it in oral surgical operations with complete success, as in the removal of epulis and the re implantation of teeth. In the case of a young lady who suffered from a very severe and painful nervous affection, it was decided to make an exploration for a non-erupted wisdom-tooth, to which the trouble was ascribed. Half a grain of cocaïne in solution was injected, one-half of the drug on each side of the alveolar border over the supposed site of the missing tooth. Seven minutes later the first incision was made, and the bone exposed, and sounded in two or three places, but no tooth was found. The operation lasted ten minutes, and was absolutely painless. In acute periosteal inflammation due to dead teeth, extension from acute pulpitis, or from external causes, cocaïne injection had given unsatisfactory results, but combined with the injection of antipyrine its effects were excellent. In periosteal inflammation which does not yield readily to the usual remedies, he injects first seven minims of 5 per cent. solution of cocaïne muriate, to anesthetize the part, and five minutes later fifteen grains of antipyrine dissolved in fifteen minims of water.

The pain will usually disappear in three-quarters of an hour. Fifteen grains of the antipyrine is administered internally one hour after the injection. The only trouble from this treatment is an induration and slight swelling of the injected part, which lasts for a few days, but is painless.

He uses the muriate only, preparing the solution himself nearly every day, so that it is always perfectly fresh. For convenience he keeps a supply of powders, each containing one grain of the salt. When he wishes to make the solution he measures, with the hypodermic syringe, twenty minims of distilled water, which is put into a small glass and one of the powders dissolved in it. Half of the quantity, or ten minims of the solution, which contains a half-grain of the salt, is required for an adult. Many practitioners inject a grain, but half that quantity properly used will give exactly the same results, and the risk of general accidents is much reduced. In June, 1886, he gave at one sitting, to a young man who wished to have eight roots extracted, a grain and a half of the cocaïne salt without any unpleasant effects following, but he would not advise nor would he himself again administer such a quantity.

Following is his method of procedure: Previous to inserting the hypodermic needle, strict antiseptic precautions must be taken. After obliging the patient to rinse his mouth with permanganate of potash solution, he passes over the part to be punctured a piece of cotton dipped in bichloride solution, 1 to 1000. Then taking ten minims of the cocaïne solution into the syringe, the needle is inserted on the outside of the gum, midway between the neck of the tooth and the apex approximately. The needle is held very obliquely to prevent it from sliding on the bone, and is pushed to the depth of a half-inch, when half the quantity (five minims) of the solution in the syringe is introduced very slowly. The liquid should pass out in a comparatively easy manner if the needle is inserted well.

The remaining solution in the syringe is then at once injected on the palatal side of the tooth in the same manner. If two or three roots close together are to be extracted, they should be surrounded by four injections of two to two and a half minims each. Local anesthesia is almost immediately secured, but it is more complete in from five to ten minutes. While injecting, a bleaching of a zone of the gum centering about the point of injection, which becomes very white and hard, will be observed. This appearance, however, passes away shortly. In the great majority of cases there is no pain except that caused by the introduction of the needle.

The local action of the drug is probably twofold: its immediate effect being to produce anemia of the injected part, probably by stimulating the vaso constrictor of the peripheral vessels; the local

anesthetic effect is due, according to Laffont and Arloing, to inhibitory action on the peripheral sensitive nerves. As with all agents which act on the peripheral nervous system, sensibility to pain alone disappears, while tactile sensation remains. Patients report that they feel nearly every step of the operation under cocaïne injection, but without pain. Cocaine is, therefore, a true local anesthetic. Brown-Sequard has demonstrated that cocaïne injected directly into a vein produces general anesthesia similar to that of chloroform or ether, with insensibility to both painful and tactile impressions.

The local accidents caused by cocaine are sloughing of the soft parts surrounding the point of injection and local necrosis of the denuded bone. He had had but one accident of this character, a slough and the necrosis of a piece of the alveolus about the size of a pea, opposite a superior wisdom-tooth. He believes that the sloughing of the soft parts in these cases comes from neglect of antiseptic precautions, and that the bone-necrosis, in the great majority of instances, is due to injecting the liquid with the needle near to or directly in contact with the bone, the force of the injection producing a local periosteal detachment, and thus exposing the bone. Therefore, when he feels that the needle has struck bone, he invariably withdraws it somewhat before injecting.

Generally no unpleasant symptoms follow the injection of one-half grain of cocaïne muriate, and no physiological action is noticeable if the patient is in a perfect normal state, and has no fear of the operation. If, however, the patient is frightened and cannot be convinced that there is no danger, extreme care must be taken, and he would even advise postponing the operation. Injection under such circumstances will certainly produce *partial* unconsciousness. Of the three cases of general accident before mentioned, two occurred in his early practice, when he used one grain of the salt, and the third followed the injection of one-third grain in a very anemic patient. The following symptoms were observed: About a minute after the injection the patient complains of a strange feeling in the head, then becomes pale, and with the increase of the pallor complains of cold all over (one case had formication in the extremities). The pulse rises to from 110 to 130. Respiration is slowed and becomes embarrassed and gasping. He had never seen complete unconsciousness, and he makes it a rule to keep talking to patients in this faint condition to prevent their becoming drowsy, which he thinks is a point not to be overlooked. The partial unconsciousness produces in the patient the awful sensation of fear of approaching death. Consciousness is not entirely lost, though it may seem so to those about the patient. Dr. Dejerine reports that a patient, who was apparently unconscious for half an hour after a hypodermic

injection of fifteen grains of cocaïne, assured him afterwards that he felt him pinch his hands.

The pallor and the sensation of cold in the extremities indicate certainly a general vaso-motor disturbance. Cocaïne seems to influence very materially the circulation as well as the respiration, which is probably due to a great disturbance of the cerebral circulation at the base of the brain, resulting in cerebral anemia. One of the first symptoms in fright is pallor of the face, indicating a vaso-motor disturbance of this region. If the fright is kept up long enough, the patient will feel cold and a fainting sensation will manifest itself, which may go on to absolute unconsciousness. Here again is a great disturbance of the cerebral circulation,—constriction of the vessels producing anemia of the brain. If to a patient whose peripheral and cerebral circulation is already interfered with by fright, cocaïne, which produces the same train of symptoms, is administered, an apparently increased physiological action of the drug will result, and the operator must be prepared to meet the usual incidents as above described.

The remarkable influence on the patient of previous knowledge of the possible effects of cocaïne is well illustrated by the case of a lady who came to him to have a tooth extracted under cocaïne injection, and whose physician had given her an inaccurate description of the unpleasant symptoms which sometimes presented themselves. She was so frightened that he wished to postpone the operation, but she insisted on his proceeding. Telling her that he was going to inject the cocaïne, he introduced into the gum over the tooth ten minims of distilled water. In less than a half-minute she complained of a terrible sensation in her head, and crying out, "I am dying," she fainted,—a clear case of self-hypnotization, as her physician had forgotten to describe the peculiar faint feeling, accompanied by *semi*-unconsciousness, which characterizes the cocaïne disturbance.

The only accident in Dr. Hugenschmidt's practice not attributable to fear was in the case of a young married lady, aged twenty-three, apparently in perfect health, and very courageous. A slight cutting operation in the back part of her mouth being necessary, only one-third of a grain of the salt was injected. In less than a minute she complained of the strange feeling in her head, followed by the characteristic rapid pulse, disturbed respiration, etc. The patient was immediately placed on her back, and five drops of nitrite of amyl given her to inhale, after which a hot brandy punch, to which was added forty drops of sulphuric ether, restored her rapidly. He then learned that she was extremely anemic, though neither her face nor her lips indicated such a state. She had suffered from fever in India, and five months previous to the administration of the cocaïne had

had a miscarriage which obliged her to remain in bed for three months.

Cocaine, then, is contra-indicated for anemic persons. It should also be used with caution—not more than one-third grain doses—in the case of obese persons, in whom the state of the circulation is always doubtful; also for old people, in whom there is a tendency to an atheromatous condition of the blood-vessels. Hysterical patients are also to be carefully managed to prevent bringing on a hysterical attack. When the patient has cardiac or pulmonary disease, Dr. Hugenschmidt recommends special care. In such cases he never injects more than one-third of a grain, and he has always refused to administer it to persons suffering from advanced constitutional diseases, such as the last stages of tuberculosis, diabetes, etc.

A fact worth noting is the apparent innocuousness of cocaïne to plethoric subjects, in whom the cerebral circulation is certainly very active. He has used the cocaïne injection for several such patients, not one of whom experienced any of the cocaïne symptoms, and all of whom reported that they felt perfectly well and comfortable. As cocaïne seems to rapidly lessen the cerebral circulation, would it not be advisable to try hypodermic injections of this remedy in cerebral hemorrhage or apoplexy, or in sun-stroke?

He has never tried the combination of carbolic acid and cocaïne: first, because he is perfectly satisfied with the pure drug, and second, because he does not see the advantage of bringing together two drugs so entirely different in their mode of action. Cocaïne acts on the peripheral sensitive nerves in such way as to render the part insensible to pain, but not to sensation; while carbolic acid is a coagulant local anesthetic, producing insensibility by destroying definitively the physiological function of the albuminous constituents of the part with which it is brought into contact.

In the treatment of unpleasant symptoms arising from cocaïne injection, Dr. Hugenschmidt gives the following directions: Place the patient in the recumbent position as soon as he feels faint, and prevent drowsiness by talking to him. Smelling-salts may be used. If the patient remains pale, with rapid pulse and embarrassed respiration, place five drops of nitrite of amyl on a handkerchief and direct the patient to inhale it until he feels better. Ten minutes later this may be repeated if necessary. The forty drops of ether in the brandy punch given to the anemic patient before referred to had an almost immediate result. In case of severe poisoning, where several grains of the cocaïne have been taken, two or three hypodermic injections of thirty drops of ether can be given, which will certainly act favorably on the disturbed circulation.

[In a communication dated some time after the foregoing paper was

prepared, Dr. Hugenschmidt states that the number of his hypodermic injections of cocaïne has passed four hundred, with only one case, since those reported, presenting slight general symptoms which lasted only a few minutes, the nitrite of amyl being employed with excellent results.

He also mentions the omission from the paper of a very important point in the extraction of teeth in an absolutely painless manner. When the parts surrounding the root have been anesthetized by the cocaïne injection, the forceps should be gently pushed into position and the extraction made very slowly, without attempting to extract by a single twitch or pressure.

He reports six implantations (Younger's operation). In five of these only one-half grain of cocaïne muriate in ten minims of water, injected as before described, rendered the operation perfectly painless. In the sixth case sensibility returned rapidly and an additional injection was necessary. In excessively sensitive dentine the hypodermic injection of one-third of a grain of the drug as near as possible to the end of the root gives good results.]

Dr. L. G. Noel, Nashville, Tenn., read a paper which briefly mentioned some of the more important drugs used by dentists. Of pain-obtunders or local anesthetics,—chromic acid, chloride of zinc, cocaïne, iodoform, menthol, aconite, veratrina, and the refrigerants,—the two first named were not and probably would not be extensively employed because of their irritating action. Dr. Bogue's formula for the use of veratrina for sensitive dentine is as follows:

℞ Veratrina, gr. iv;
Tannic acid, gr. j;
Alcohol, gtt. xx;
Glycerin, f℥i;
Carbolic acid, ℨij. M.

Thoroughly dry the tooth and apply to the sensitive surface.

The writer's experiments with Herbst's obtundent have been more successful than with any other cocaïne preparation, a fact which he attributed to the combination of two or more local anesthetics in one solution. Care must, however, be taken to protect the enamel from the influence of the sulphuric acid, the difficulty of doing this almost precluding its use for destroying the sensibility of the gum. Creasote and carbolic acid are perhaps the most efficacious medicaments for that form of odontalgia arising from exposure and inflammation of the pulp. Of the two the writer gave preference to pure wood creasote, full strength. Solutions of these agents are valuable as deodorizers, germicides, and reactive stimulants, in the treatment of alveolar abscess, disease of the antrum,

purulent inflammation of the gums, pyorrhea alveolaris, etc. White oxide of zinc and creasote, full strength, applied directly to exposed pulps, as directed by Dr. J. S. King, is very soothing. In the use of arsenic the writer has found Dr. E. C. Kirk's prescription,—

> ℞ Arsenious acid, in fine powder,
> Cocaïne hydrochlorate, āā gr. xx ;
> Menthol crystals, gr. v ;
> Glycerin enough to make a stiff paste,

very valuable, but he preferred to substitute sulphate of morphia for the menthol and creasote for the glycerin, making the formula practically the same as the old and well-known prescription, with the addition of cocaïne. This trio of sedatives serves to anesthetize the pulp until the congestion induced by the arsenic has progressed far enough to cut off sentient connection.

Heat is one of the most valuable antiseptic agents before using drugs.

A quick way of preparing a solution of mercuric chloride is to keep at hand powders containing one grain each of mercuric chloride and ammonium chloride, and when a solution is wanted add one of the powders to an ounce of distilled water. Another method is to take of corrosive sublimate and hydrochloric acid each one drachm, and of distilled water enough to make one ounce. This forms a perfect and permanent solution, one teaspoonful of which in a pint of water makes a solution of 1 to 1000. One application of the compound tincture of iodine injected full strength through the pus tract will often work a complete cure of alveolar abscess. Iodoform is also a valuable germicide and disinfectant. Prepared after Dr. C. N. Peirce's formula,—

> ℞ Iodoform,
> Oil of cloves,
> Oil of eucalyptol, āā ʒ vi,

the disagreeable odor is disguised and an effective dressing is the result. Dr. E. C. Kirk makes a paste of iodoform with oil of cinnamon for the same purpose. Iodol has only lately been brought to notice as an efficient germicide without toxic properties. Hydronaphthol is recommended by Dr. James Truman as an ingredient in a mouth-wash for diseased gums. Hydrogen dioxide (peroxide of hydrogen) is strongly indorsed as a remedy in pyorrhea alveolaris. It possesses remarkable powers in eliminating and checking the formation of pus. Dr. Noel related a case of abscess in which, after iodine had failed, the injection of peroxide of hydrogen caused a remarkably rapid improvement. Dr. Black uses it in combination with mercuric chloride in the treatment of abscess and other diseases requiring antiseptic and germicide effects.

Zinc chloride has been used as an obtundent of sensitive dentine, but is of more value as a disinfectant. It is used with good results upon diseased gums in mouth-washes. Boric acid is a valuable antiseptic and germicide, and is used in solution (twenty grains to the ounce of water) in the treatment of aphthous ulcerations of the mouth and fauces. Alcohol is the most valuable cleansing agent in the dental pharmacopeia. In the treatment of pulpless teeth any system of disinfection is incomplete that does not contemplate the thorough cleansing of the entire substance of the dentine. The fluid contents of the dentinal tubuli may be extracted with alcohol as in no other way.

Dr. Harlan read the report which he had prepared as Chairman of Section V, American Dental Association, as follows:

During the years 1887–88 many new remedies have been proffered for use in dental medicine and surgery, most of them being on trial by dental therapeutists at this time. Included in this list, which is not complete, may be found creolin, sodium fluor silicate, guaiacol, several coal-tar derivatives, and the active principles of many of the essential oils. The activity in chemical circles is so great that medical literature is burdened with the number of remedies belonging to the antipyretic and the anti-neurologic classes. Among the latter may be mentioned antipyrin and antifebrin, constitutional remedies of great value in facial neuralgia. The continued study of microbes and the lists of germicides and disinfectants to annihilate them go side by side. No sooner is a new microbe discovered than the therapeutist offers a choice selection of disinfectants, from which selection is to be made for destroying the spores and rendering operations free from septic infection. The tendency of present practice in dental therapeusis is to use such medicaments as are least harmful to normal tissues, but which will afford a certain destruction of the microbes present. I wish to call your attention for a few moments to guaiacol, a derivative of wood creasote. It is a light straw-colored liquid, pungent to the taste, but less objectionable to smell than its parent. Guaiacol and cresol are both isolated from creasote, and they may be considered the active principles of creasote. Guaiacol is used in internal medicine, but in dental surgery few practitioners have availed themselves of the opportunity of using it. It will combine with all the drugs that creasote will, and being sparingly soluble in water it is one of the agents which may be used as a permanent disinfectant of root-canals. Combined with the common oil of cassia, it loses what little disagreeable odor it possesses, and we have then united two of the most powerful oily disinfectants now known. It may not be generally understood that the oil of cassia is a potent restrainer of the growth or development of the

bacteria of the human mouth. However, from experiments made under the direction of Prof. G. V. Black, of Jacksonville, Ill., oil of cassia was shown to be the best restrainer of the growth of microbes out of a long list of drugs experimented with. Many drugs tested were found absolutely valueless, and others of feeble power. Wood creasote, oil of cassia, and an acidulated solution of bichloride of mercury were found the most constant and unvarying in their inhibitory power over the microbes of the human mouth. It was from the results of these experiments that I was induced to join guaiacol and oil of cassia and make use of them in the disinfection of foul and putrid roots of teeth.

It cannot be questioned that to-day even the subject of the disinfection of pulpless teeth has a great charm for the faithful experimenter, whose sole desire is to accomplish this effect in the most perfect manner. In spite of the vast number of papers read on the subject and the discussions thereon, a wide difference of opinion and practice prevails throughout the civilized world. My only object in recalling your attention to this phase of dental practice is that more light may be thrown on the subject, in order that such teeth may be retained in the mouth for a longer period of time and usefulness and in greater comfort for the possessor. The advanced dental surgeon and hobby-rider is just as apt to ride a hobby as the routine-worker is to be a stumbling-block in the path of progress. But the hobby-rider, from much study, many failures, and unceasing experiment, will in time be able to do more good in practice than the routine-worker, for from all his experiments he is able to formulate a system based on failures as well as successes, avoiding the pitfalls into which the routine-worker is continually stumbling. It is from long experience in this direction that the writer has the temerity to say that a pulpless tooth, after the decomposition of the pulp within it, is in need of disinfection by the use of medicaments in every case, as no amount of cutting short of its total destruction will disinfect it. When a pulpless tooth is to be quickly disinfected, an aqueous solution of a drug must be used; if potent, it should be in weak solution. When slow disinfection is to be accomplished (many times desirable), an oily disinfectant should be used, one fully or sparingly soluble in water. The reason for these statements being that in the first case aqueous solutions easily and quickly permeate the contents of the root-canal and dentine, and in the latter case the oils slowly deposit vaporizable camphors, which are potent disinfectants that readily penetrate the infected territory and slowly but certainly disinfect it. At the same time the oils being sparingly miscible in one-half water, their integrity is unimpaired for long periods of time. I have placed within a pulp-chamber, both foul-

smelling and full of débris, a drop or two of guaiacol and oil of cassia, and sealed the cavity of decay with a cotton plug dipped in sandarac, and allowed it to remain for forty, sixty, and seventy days, and on removal the contents were found to be completely disinfected, and the root was filled without causing trouble. It is on account of the hitherto unsuspected value of the oils in dental surgery that I recall your attention to them in the hope that they may prove of value in your hands.

Dr. D. Genese, Baltimore, said that many of the drugs mentioned by Dr. Noel were old. The local use of ether for the relief of pain was long anticipated by the application of cold. In 1854 Dr. Walter Blundell, of London, used cold water and salt to cause local anesthesia. He devised an apparatus by which the water was first applied at normal temperature, and then the salt was added gradually till the mixture was cold enough to produce insensibility of the part. A valuable remedy not mentioned is the extract of white poppy, which gives the sedative action of opium without the soporific effect. It can be used freely in the oral cavity, and gives almost immediate relief in cases of intense pain from acute abscess. The sulphide of calcium given internally will so hasten suppuration that there is very little difficulty in treating such cases. Tincture of gelsemium is excellent for facial neuralgia.

Dr. Storey stated that he sometimes employs rapid breathing as a local anesthetic.

Dr. John S. Marshall, Chicago, wished to ask Dr. Harlan a question. Dr. Harlan says that with the new remedy guaiacol, mixed with oil of cassia, a pulpless root can be perfectly disinfected. How does he know that the disinfection is perfect?

Dr. Harlan. By filling the roots and having no after-trouble.

Dr. J. D. Patterson, Kansas City, does not think that is the best demonstration. He wants to ask if it is not possible to get at the shortest time necessary to thoroughly disinfect and destroy the germs found in pulpless roots. It would be a useful fact to know the time necessary to wait after treating such teeth before the filling can be safely inserted.

Dr. W. Xavier Sudduth, Philadelphia. There is no other way to accomplish the result in practice. The time required to destroy the life of the germs can be demonstrated scientifically in culture-tubes, but it is hardly possible in actual practice.

Dr. F. Peabody, Louisville, some years ago had read a paper before the Kentucky State Dental Association in which he described the cure of an abscess by filling the root-canals of the tooth affected with crude lead. As to the cause of this cure he can get no infor-

mation, and if anyone present could give a satisfactory explanation of it he would confer a great favor. It was, briefly, a case of chronic abscess, with a clear track, in the treatment of which the whole range of remedies was gone through without success. After eight months' treatment he made up his mind to extract the tooth, round up the root, and replace. The patient requested him to wait a couple of weeks, and in casting about for something to fill the roots so as to give them strength, he picked up a piece of sheet lead of about the size and shape of the canal. This was inserted, and at the end of two weeks the patient returned with the abscess cured. That was ten years ago, and it is well to-day. In another case, some time afterward, where the foramen was as large as a pin's head, he was conscious that the lead used had gone beyond the foramen, but he did not remove it, and, after filling thoroughly, mounted a porcelain face with a gold backing. This remained for two years, when the tooth becoming loose it was removed, the root being found fractured. The root was extracted. He had made up his mind that the lead had formed some salt with the serum, but when the root was extracted it was found that the lead had passed through the foramen about a half-line, and its angles were just as sharp as when it was put there. He has practiced the method of filling roots with lead almost invariably in such cases, and mostly the abscess is cured; certainly in seventy-five per cent. of the cases.

Dr. J. J. R. Patrick, Belleville, Ill., has found three therapeutic agents invaluable in his practice, namely: peroxide of hydrogen, corrosive sublimate (as a germicide and disinfectant for parts which he can get directly at and so control the action of the remedy), and nitrate of silver. The oxygen of the peroxide of hydrogen breaks up the red blood-corpuscles and the hydrogen goes for the pus-corpuscles, for which it seems to have an affinity. In treating abscess with fistulous openings there is always more or less pus to be got rid of, and sometimes when the track passes the roots and through the cancellated bone the pus remains in the cancellated bone, where it is difficult to get at. Thrown into a corner or into a cul de sac, peroxide of hydrogen will clean it out quicker than anything else. Hence he always uses it in fistulous openings. Nothing is gained in treating a fistulous abscess, after the root-canals are thoroughly cleansed, by postponing the filling, as the abscess can be treated just as well from the outside.

Dr. Sudduth. Dental therapeusis is one of the most interesting and vital subjects before the dental profession to-day. It is a question as to what antiseptic or germicide is best to use. There is no question as to the value of corrosive sublimate, but its use is restricted. It can be used in root-canals because the quantity used

can be limited. But there is another direction, in the compounding of tooth-washes, where corrosive sublimate cannot be used. Silicated fluoride of calcium is a valuable germicide, which is also strictly non-poisonous, and it will be largely used for its antiseptic quality in the tooth-powders of the future. One word as to the relative value of corrosive sublimate and carbolic acid. In acute inflammation the corrosive sublimate is best, because all that is required is to kill the germs; in chronic cases a stimulant is needed, and for that reason the carbolic acid is better. In answer to Dr. Peabody's request for light, he would say that four conditions are necessary for the development of germs. If any one of these be taken away the development is stopped, and it is probable that the lead filling, perfectly introduced, accomplishes this.

Dr. C. H. Harroun, Toledo, thinks there was no therapeutic action from the lead inserted in the cases reported by Dr. Peabody. The cavity was simply closed up perfectly, which stopped infiltration and prevented the continuance of the irritation. Too much treatment in these cases is frequently the cause of failure. They are stuffed and treated so much that they have no chance to get well.

Dr. L. C. Ingersoll, Keokuk, Iowa, wished to call attention to the necessity of stimulation in the treatment of chronic alveolar abscess. The tendency is when a new thing is introduced to ride the hobby to death; but there can be no real cure till all the factors are taken into consideration. It is necessary to destroy the germs, and a mechanical operation is also needed to close up the root perfectly. But this is not all. There is a morbid condition, which must be removed, and a normal condition induced by the use of a stimulant, or still better by the employment of a remedy which has escharotic qualities in addition to its value as a stimulant. Dr. Wilson, in his paper, mentioned points about the anatomy and the relations of the apical portion of the tooth not brought to our attention previously, which will help to the proper consideration of the means of treatment. Any drug which will produce stimulation may remove the morbid condition before the cementum becomes deanimalized; but we must not get crazy over the fact that we are using an antiseptic, and therefore imagine that nothing else is necessary. It must not be forgotten that in addition a stimulant is required.

Dr. W. H. Morgan, Nashville, wished to emphasize the use of carbolic acid as a stimulant in addition to its escharotic powers. He has found nothing else equal to it for producing healthy granulations. While on the subject of stimulants, it should be said that we want to use this article when we wish to produce granulation; but sometimes stimulation is desired to promote absorption. In that case tincture of iodine should be used. If there is another drug

better than this he would be glad to know and use it. With regard to root-filling, he does not believe there ever was a root filled with chloro-percha. The chloro-percha may be injected till the root is full, but when the chloroform is gone it will not be full, and that is why he objects to this method. All animal and vegetable tissues, as they lose their fluids, contract, and this is no exception to the rule. The fundamental principle in treating disease is to remove the cause. The cause of alveolar abscess being in the root-canals or the dentine, if you will put them in good condition you will stop the abscess.

Dr. G. S. Staples, Austin, Texas, had tried for years everything suggested by everybody for the treatment of these cases, and none of the methods was satisfactory. His idea was that carbolic acid only acted superficially. Dr. Storey suggested his remedy, and he had never failed with it but once. He uses oxide of zinc mixed as thick as it can be forced through with carbolic acid.

Dr. Harroun mentioned what is known as the Robinson remedy as excellent in the treatment of pyorrhea alveolaris. He has yet to see the case that is not at least partially cured by its use.

Dr. A. O. Rawls, Lexington, Ky., stated that in his view of the etiology of pyorrhea the earliest cause is found in some element in the bichloride of mercury. The disease may be either acquired or hereditary, and he believes that all local treatment is worthless when relied on to effect a permanent cure; that at most it will merely alleviate the trouble, and it may again recur. Many object to this view, but if they will carefully watch their cases they will find a difference between the curable and the incurable. Those which are incurable, in his opinion, are caused by the bichloride or some of its elements in some other form. There are times and conditions in one's life when certain tissues are susceptible to certain influences which make no impression on them at other periods. We find that the action of mercury as a transmitted effect is shown at certain times. When such cases are judiciously treated, we may see the teeth become strong in their positions and remain so for a long while, even so long as twenty years. His observation is that the disease is less destructive in acquired than in hereditary cases. But certainly the pericementum once broken through the influence of mercury is always broken, and there seems to be no way by which it can be restored to perfect health. As to cure, he believes that true pyorrhea alveolaris cannot be perfectly and permanently cured, at least he has never seen what he calls a typical case cured.

Dr. Storey sees more pyorrhea every day than anything else, and he does not believe that mercury is the cause of it. Will Dr. Rawls tell what the mercury was taken for?

Dr. Rawls replied that in the early days, mercury and blood-letting were about the only remedies used for fevers and that class of diseases.

Dr. Storey's observation was that the pyorrhea was caused by the very troubles for which the mercury was taken as spoken of by Dr. Rawls.

The subject was passed, and Physiology and Etiology was called.

Dr. H. A. Smith, Cincinnati, read a brief report, submitting papers by Drs. Ottofy, Patterson, and himself.

Dr. Smith then read his paper, which was entitled, "Dental Implantation." [See page 803, current issue of the DENTAL COSMOS.]

Dr. J. D. Patterson read his paper, entitled, "Points in the Etiology of Pyorrhea Alveolaris." [See page 798, current issue of the DENTAL COSMOS.]

Dr. Louis Ottofy, Chicago, read his paper on "The Incipiency of Dental Caries." [This paper will appear in a future number of the DENTAL COSMOS.]

Adjourned to 3 P.M.

Afternoon Session.

The joint session convened pursuant to adjournment, President Catching in the chair.

The discussion on Dr. Smith's paper was passed until the report of the Committee on Anatomy, Pathology, and Surgery should be read, and Dr. Patterson's paper was announced as open for discussion.

Dr. Genese wished to say that two of the most useful preparations he had ever used in the treatment of pyorrhea alveolaris are boracic acid and aromatic sulphuric acid. He first cleanses all the roots with a curved instrument to remove the deposits, and then thoroughly syringes the parts with aromatic sulphuric acid diluted one-half with distilled water, after which he directs the patient to use night and morning a powder containing boracic acid one drachm, precipitated chalk one ounce.

Dr. Storey referred to his asking, when a previous discussion touched on pyorrhea, why the patients in whom Dr. Rawls traced the first cause of this disease to the use of calomel, took the calomel. In a word, they took it because they were sick, and the pyorrhea was the result of the diseases from which they suffered, not of the remedy. He is satisfied that many of the patients we see suffering from this disease would not now have it if they had taken more calomel. He lives in a region where calomel is an absolute necessity. Under the bacteria theory they tell us that there is nothing like bichloride of mercury to kill the germs. Calomel is only a

weaker form of the same agent; it does in a smaller way what the bichloride, which is better for local application, does. Pyorrhea alveolaris is, to his mind, a constitutional disease, and it comes from some of those troubles which are visited upon the heads of the children to the third and fourth generations. No man can say that he has none of the results of the iniquities of his forefathers in him, nor can any of us say to what extent they may exist. Pyorrhea is very prevalent in his district, and he confesses that he cannot cure it. He uses all the remedies that are recommended, and the cases get well apparently, but in six months they are back as bad as ever. If you want to eradicate it, you must go back three or four generations. Aromatic sulphuric acid is his sheet anchor, and he uses it in full strength. If there are pockets he fills them up with the aromatic sulphuric acid and gets out the pus with it,—destroys all the "bugs" with it. It cleans off the tooth perfectly. Then he puts the patient on

2 oz. prepared chalk,
1 oz. lac sulphur,
½ oz. borate of soda,

mixed well to a fine powder, to be placed in the mouth every night on going to bed. This treatment comes nearer than anything else in his hands to effecting a cure. Some of his patients whose teeth are kept in the best condition as regards cleanliness, suffer from this disease.

Dr. John S. Marshall had a case of this kind some nine months since. A lady called with the left superior central incisor badly diseased from pyorrhea. The tooth was attached only on the palatal wall, and could be twisted around in its socket. It was also elongated about a quarter of an inch. He thought to effect a cure by replantation. He therefore took an impression of the parts and extracted the tooth, upon which he found three little points of calculous deposit, not larger than pin-heads. On drilling into the tooth a live pulp was found, which he removed, cleansing the canal thoroughly, using bichloride of mercury, deepened the socket and replanted the tooth, which was retained with a splint. The splint was worn for four months, when it was removed and the tooth was found apparently attached. The splint was replaced and was again worn four months. When the splint was finally removed the tooth was found to be just a little loose. There appears to have been a reproduction of the alveolus around the tooth, and the recession of the gum is not more than one-sixteenth of an inch. Before the operation it was much more.

Dr. Atkinson usually finds teeth affected by pyorrhea alveolaris out of the line of the arch. He has been treating a case of a lady

who had not lost any of her teeth, but the left superior central incisor projected half the length of the crown, and all the teeth were very loose, the gums tumid, and there was a heavy discharge of pus. It is his method to act upon the inspiration of the moment, and not to follow any set rule. In this case he tied the teeth where he wanted them to be before he started to clean them, and trimmed them with a corundum wheel to make the occlusion correct. After cleansing the mouth the pockets were dried with bibulous paper, and aromatic sulphuric acid was dropped in till all the little pools were full, little wisps of bibulous paper being placed around previously to protect the tongue. When the acid was fully soaked in he used bicarbonate of soda to get rid of the surplus. He did not attempt at this sitting to remove the calcareous deposits. The next day the patient said she had eaten her first meal with comfort for an indefinite time. He then attempted to clean the teeth, but he had never yet succeeded in cleaning such a case at one sitting. He does not attempt to remove the deposits by pulling, but uses an instrument which has no point and no edge, to drive them. If a portion of the deposit is not cooked by the first application he again touches it with the aromatic sulphuric acid to turn it to the grayish appearance which follows this treatment; then takes folds of bibulous paper and smears it with a paste of tannin and glycerin, and sends the patient away. If the aromatic sulphuric acid has not done its work in a week it is not suited for the case. In this instance he applied a paste of caustic potash and carbolic acid, about one and a half to two of the carbolic acid to one measure of the caustic potash, mixed under hot water. Small portions were laid around in all places which could be reached with tweezers. When the deposits were removed it was found that there was not a bit of the alveolar process in the upper jaw from the median line to the first molar. The anterior root of the right inferior first molar was absorbed more than one-half. In three months the right side was all right, but the left side, from the central incisor back, was just as leathery as when the treatment began, though the patient eats on it.

Dr. Morrison would suggest to Dr. Atkinson the use of delicate long-bladed spicula forceps for scaling in such cases.

Dr. Taft. The first indication in the treatment of pyorrhea alveolaris is to have as complete a diagnosis as possible. This means more than seeing that the gums are separated from the roots by deposits of calculus. The first thing to learn is what kind of a patient, what kind of organization have we to deal with. Is it one in which nutrition is good, so that it has a tendency to resist disease? Accidental conditions also are to be considered. Is the patient in good general health? When we have learned this

much we are ready to go on with the treatment. In these cases there is always a local irritant, which must be remedied. Just what part micro-organisms play in the causation of pyorrhea is not definitely settled. The irritation arising from the disease is more active in some than in others. The indications are to take away the irritants, whatever they are, even if apparently of the slightest moment. If organisms are present, antiseptic treatment is necessary. What does aromatic sulphuric acid do? First of all, it dissolves any calcareous deposits present. Most of the organisms will be very much troubled by a dose of aromatic sulphuric acid. Dr. Storey uses aromatic sulphuric acid full strength; Dr. Atkinson prefers pure sulphuric acid, one part to seven of water. It is impossible to effect any restoration while there is any deteriorated tissue in the pockets. This must therefore be taken away. When this is done, and a good, clean surface is exposed out from which there is a flow of good, clean plasma, the process of repair will go on readily; but favorable results must not be expected in all cases. Ordinarily it does not take very long to put the case on the road to reparation, and when it is well started it should be let alone. Aromatic sulphuric acid or the carbolic acid and caustic potash paste ought rarely to be used more than once. When the mouth is got into good condition there is as complete restoration as the physician can get in any condition of ill health.

Dr. Storey replied that he does all these things, but the constitutional trouble is still there, and the patient comes back in about six months.

Dr. Friedrichs wished to ask Dr. Taft how long the mouth remained in good condition after being restored by the use of aromatic sulphuric acid.

Dr. Taft. As long as there is perfect cleanliness. Cases return because there has been a lack of thoroughness in their treatment. It should be remembered that feeble patients afford the most difficult cases to treat. It cannot be insured that a patient once cured will never contract the disease again.

The subject of pyorrhea alveolaris was passed, and Dr. Ottofy's paper was taken up, and passed without discussion.

(To be continued.)

PENNSYLVANIA ASSOCIATION OF DENTAL SURGEONS.

At the recent annual meeting of the Pennsylvania Association of Dental Surgeons the following officers were elected for the ensuing year: G. W. Adams, president; E. H. Neall, vice-president; T. F. Chupein, recording and corresponding secretary and reporter, and W. H. Trueman, treasurer and librarian.

GEORGIA STATE DENTAL SOCIETY.

The twentieth annual meeting of the Georgia State Dental Society was held at Dalton, Ga., August 22 to 26, 1888.

The following officers were elected for the ensuing year: Samuel A. White, president; W. F. Tignor, first vice-president; J. A. Thornton, second vice-president; H. H. Johnson, recording secretary; L. D. Carpenter, corresponding secretary; H. A. Lowrance, treasurer; R. W. Thornton (chairman), W. H. Weaver, D. D. Atkinson, J. A. Chapple, and H. S. Colding, executive committee.

The next meeting will be held at Tybee Island, near Savannah, on the second Tuesday in May, 1889.

L. D. Carpenter, *Cor. Secretary*, Atlanta, Ga.

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

On the occasion of its tenth anniversary the Odontological Society of Pennsylvania will hold a two-days' session, commencing at 2 o'clock on Wednesday, December 12, 1888. The programme will consist of addresses and essays upon subjects pertaining to dentistry which will be especially prepared for the occasion by leading members of the profession.

A series of clinical demonstrations will also be given by a number of gentlemen having new features relating to special methods of dental practice to present.

An interesting exhibit will also be made by dealers in and manufacturers of dental goods and appliances, who will be afforded ample opportunity to show their latest improvements in their respective lines.

The committee having the matter in charge have determined to make the occasion a notable one, and no pains will be spared to render the meeting interesting and attractive. A general invitation is hereby extended to the dental profession to meet with us and take part in the exercises and discussion of papers.

The programme will be issued at an early date.

H. C. Register, M.D., D.D.S.,
Chairman of Anniversary Committee.

CONNECTICUT VALLEY DENTAL SOCIETY.

The twenty-fifth annual meeting of the Connecticut Valley Dental Society will be held at Springfield, Mass., on Thursday and Friday, December 6 and 7, 1888.

George A. Maxfield, D.D.S., *Secretary*,
Holyoke, Mass.

EDITORIAL.

DENTAL DIPLOMAS AND DENTAL LAWS.

The rapid increase in the number of dental educational institutions in the United States suggests the consideration of some subjects of great importance to the dental profession of to-day, and of yet greater consequence to the dental graduates of days to come.

In the current number we publish for reference a list of the dental educational institutions in this country, with the dates of their respective organizations as nearly as we could ascertain them These schools matriculate and graduate every year many students not alone from our own country but from every civilized nation in the world.

Nearly all the States now have upon their statute-books acts "to regulate the practice of dentistry, . . ." and many of the larger cities have one or more institutions which confer dental diplomas. Both the laws and the colleges seem generally to have resulted from the efforts of resident dentists acting independently of their professional brethren in other parts of the country, and thus, as might reasonably have been expected, there has come to be a manifest lack of congruity in both the legal regulating and the college graduating requirements.

By much the larger number of those statutory enactments there have been created "Dental Examining Boards" clothed with irreversible discretionary power to license or to refuse to license persons to practice dentistry within the limits of their respective States.

In August, 1883, a "National Association of Dental Examiners" was formed, whose object was "to secure through the operation of the various State Examining Boards a high and uniform standard of qualification for dental practitioners, and so far as practicable uniformity of methods in the workings of those boards, and of legislation in creating them." In pursuance of this object they adopted the complete draft of an act to be recommended for enactment by States then without any dental laws, and resolved "that this association enjoin its members to accept the diploma from no college which does not require two full regular courses of lectures, or its equivalent,—one full course and five years' practice,—previous to granting such degree." Subsequently they also resolved "that this association insists that no boards hereafter organized and becoming connected with this body shall confer degrees or titles of any nature." This resolution had reference to the fact that the Board of "Censors" in one State, New York, had conferred the title of M.D.S. (Master of Dental Surgery).

As a rule, each State Board of Dental Examiners ministerially determines the status or "repute" of institutions which either within or without the State grant dental diplomas. A decision to the effect that one dental college was not reputable was carried to the Supreme Court of the State, which sustained the board. In another State a similar case is now before the Supreme Court.

At the last meeting of the National Association of Dental Examiners a list (see DENTAL COSMOS, October, 1888, page 759) was made "of dental colleges whose diplomas the Association might recommend the various State Associations to receive in lieu of an examination."

This recommendation is a step towards the unification of State Board action with reference to the schools which it shall consider to be of good repute, but some State Boards may yet at their own option refuse to receive a diploma from either of those colleges, or may accept one from an institution not on the list.

The National Association furthermore "respectfully recommends the discontinuance of the practice of giving permits to practice dentistry to students during the time of their college work before their graduation." This indicates the possession of optional power by a board to license to practice before a college deems the student entitled to its diploma.

Practically then, in most cases, a dental diploma must be viséd by a State Dental Examining Board before a dental graduate can enter upon the practice of dentistry. The value of diploma versus license (or registration) has thus far been legally decided in favor of license, but the end is not yet. We therefore direct attention to the subject, and suggest vigorous and concerted action on the part of the National Association of Dental Examiners and Dental Faculties looking to the unification and harmonization of the laws in all the States relative to dental diplomas. The National Association of Dental Faculties, organized in August, 1884, has from the beginning sought to co-operate with the National Board of Dental Examiners, and has annually met at the same time and place as that board: indeed, at times the same men have been members of both associations.

It is, however, noticeable that, while much commendable work has been done in raising the educational standards for graduation in order that the diplomas might be acceptable to the boards generally, but little has been done towards the making of a dental diploma standard which should, with due registration, be a recognized qualification in every one of the United States.

Some consideration is certainly due the graduate who reasonably expects that the diploma for which he studies and works and pays shall be a valid professional certificate in any part of the country.

Like questions are at the fore in foreign countries, and they are furthermore complicated by international considerations. In Great Britain the license is paramount, and the diploma, which must be from a medical college or university, certifies that the graduate is a L.D.S., which, being interpreted, signifies Licentiate of Dental Surgery. A recent prosecution of dentists practicing in London under the American titles of D.D.S. and D.M.D. without registration under the law has directed attention to the fact that the diplomas of only two American institutions are on the list of the General Medical Council as entitling their graduates to register under the Dentists' Act of 1878, which declares that "A person shall not be entitled to take or use the name or title of dentist, either alone or in combination with any other word or words, or of dental practitioner, or any name, title, addition, or description implying that he is registered under this act, or that he is a person specially qualified to practice dentistry, unless he is registered under this act."

The placing of but two American institutions on the list is significant of the facts that the legal recognition of dentists is yet but rudimentary, and that such recognition having been brought about chiefly by individual rather than organized effort, the resulting dental "acts" have been varied in accordance with local desires or interests or individual preferences or prejudices. But, when through the calm and deliberate action of national dental associations there shall have been formulated carefully and broadly considered regulations such as may be pressed upon the attention of legislative bodies in all countries, there may be placed upon the statute-books dental laws that will be worthy of their origin in a profession which, while it seeks to promote its own honor and highest interests, should also endeavor to protect and conserve the best interests and welfare of the people everywhere.

The British Dental Act of 1878, modified by that of 1886, is noticeable for placing the practice of dentistry under medical control or sanction. Of course, at the outset, previous reputable practice entitled to registration; but subsequently, and increasingly so as the unqualified practitioners of 1878 shall drop from the list, the licentiates under the General Medical Council will preponderate on the register until in the near future it will contain only the names of those legally qualified by the possession of a dental diploma.

In this country there are now thirty institutions which grant dental diplomas (see list in current number), and of these the distinctively dental colleges number ten, the dental departments of universities eighteen, and the dental departments of medical colleges two.

Taking into consideration the circumstance that the universities

grant also medical diplomas, it is remarkable that the medico-dental colleges are just twice as numerous as the distinctively dental colleges. The fact may by some be deemed indicative of a dental drift towards medical affiliation, especially if it is remembered that the first dental department in a university or medical college was established in 1869, when there were seven strictly dental colleges. The increase of departments has therefore been at the rate of one every year as compared with the college increase of only one in nearly seven years.

We commend the whole subject of the relation of dental diplomas to dental laws to the careful consideration of dental alumni in all countries, and hope that by concerted action without needless delay the dental laws may everywhere be harmonized and dental diplomas have universal recognition under the laws.

In the succeeding number of the DENTAL COSMOS we shall publish a thoughtful essay upon the general subject of special legislation, the perusal of which we commend to the profession.

AN INTERNATIONAL DENTAL CONGRESS IN PARIS.

EARNEST efforts are being made by the Société Odontologique de France and the Société d'Odontologie de Paris to accomplish the holding of an International Dental Congress in Paris in August, 1889, during the period of the Universal Exposition. With that purpose in view circulars have been sent out soliciting subscriptions to a general fund and the expression of sentiments in regard to the subject. The invitation is general to dentists throughout the world to take part in the Congress, and to unite in the presentation and discussion of such matters as will illuminate and advance odontological science and contribute to the development of the art of dentistry. An analysis of the plan is set forth at length by committees representing the above societies in the *Revue Odontologique* for September. To give order to the work of the congress and facilitate discussions, various sections have been established, as follows: Sec. I, Anatomy and Physiology, Normal and Pathological; Sec. II, Operative Dentistry, Special Therapeutics and Materia Medica; Sec. III, Dental Prosthesis and Orthopedy; Sec. IV, Deontology and Education. The practical demonstrations will comprise the execution of operations in operative and prosthetic dentistry and the exhibition of new methods and appliances.

The project seems to have been conceived in a fraternal spirit, and if carried out must produce beneficial professional results. Many foreign dentists will no doubt in any event visit Paris during the coming Exposition, and the time seems opportune for such a

convocation as is now proposed. Further information may be obtained by addressing communications as follows: Monsieur le Secrétaire du Congrès Dentaire de Paris, 57 Rue Rochechouart or 3 Rue de l'Abbaye, Paris.

It thus seems that the movement towards and preparation for a congress of dentists from all nations has taken such definite shape that the place and date are announced as tentatively fixed upon by the French societies referred to, and the dentists of America are asked to confirm the choice and attend the meeting of the International or, as we prefer to call it, co-national body. To insure harmony in this it would seem to be a prerequisite that certain qualifications should be prescribed as conditions of membership. The reasons for such requirements are not far to seek, but the mere enumeration of some of them would be likely to arouse a spirit of controversy and lead to more or less acrimony in their discussion. There has already been displayed a marked diversity of opinion as to the advisability of a distinctively dental congress, since there has so recently been held a co-national Medical Congress which included dentists in its organic membership, and another such congress is to be held in 1891. The question of expediency appears to have been so far settled by so considerable a part of the dental profession in this and other countries that an independent dental congress will probably be convened. The question of what is necessary to constitute a person a dentist in fact and in law is a matter of fundamental importance, and is yet very far from a solution. It would therefore seem to be a very proper function of a co-national congress to discuss, and, if possible, to define the terms and boundaries of the question. As a preliminary to such discussion it might be well to discriminate clearly the dentist in fact from the dentist in law, including a consideration of the modifying influence of locality determining the status.

Local laws more or less specifically define and prescribe the legal qualifications within certain territorial limits, and the status in law may well be considered in determining the real position of a dentist in fact. In this country most of the States have laws which, varying in many particulars, agree in constituting a board of examiners before which every person desirous of practicing dentistry must appear and be either licensed after examination or acknowledged to be competent by reason of a diploma from a reputable institution. In some States a license can be obtained only after examination, notwithstanding the possession of a diploma, and in a few States graduation or a certificate from a State dental society is prescribed. The institution of these modern laws necessitated provisions for the licensing or registration of reputable dentists who were previously

in practice, so that all dentists in fact throughout all those States are now presumably dentists in law. As a rule, the examining boards conclusively determine whether or not an applicant may practice dentistry; if a graduate, they decide whether or not the diploma is from a "reputable" institution.

In Great Britain the General Medical Council licenses to practice dentistry after examination and registration, unless the applicant shall have been in dental practice in that country prior to the Dentists' Act of 1878, which entitles him to registration without examination. Certain specified universities and colleges are made licensing corporations under the Medical Council, and the diplomas of two designated American universities are recognized as entitling the possessor to registry and license.

The details of neither the English nor the American enactments can be given here, but the principal points are briefly stated to show that at the present time in both countries there is a legal determination of what are essential qualifications to enable one to practice as a dentist.

In both countries a graduate from a corporate institution recognized as competent to grant or confer a dental diploma may register as a dental practitioner, and is then a dentist in law as well as in fact. In the United Kingdom the dental degree must have medical indorsement to be valid. In the United States the dental degree need only be from a reputable dental institution, whether associated with or independent of a medical institution. Our British brethren, after vainly essaying the establishment of an independent dental college, seem to have settled upon co-operation with the other branches of medical practice. The whole subject has yet to be studied with great care, and, if possible, such uniformity of both sentiment and law should be made to prevail that the best interests of the public and the related professions in every country shall be subserved.

We commend the subject to the calm consideration of the co-national congress, which, we hope, will contribute greatly to the solution of these conflicting problems.

A FOREIGN LAYMAN ON AMERICAN DENTISTRY.

We subjoin an excerpt from *The Daily Telegraph*, London, which editorially illustrates to how great an extent modern American dentistry has gained the enthusiastic commendation of non-professional men of high rank and station in foreign countries. This fact, though somewhat extravagantly stated by the English editor, we put on record as showing that while professional fellowship, accorded

by the International Medical Congress, evidenced the appreciation of medically educated men, none the less significant is it that American dentistry is commanding the respect, confidence, and commendation of the lay public.

That peculiar branch of the surgical art known as dentistry has, indeed, of late years, attained many developments of an extraordinary and highly noteworthy character, especially in the United States, where its study has been pursued with exceptional assiduity. American dentists enjoy a world-wide renown for expertness and success in the practice of their profession. There are few towns of importance on the continent of Europe in which one or more of these skillful gentlemen may not be found, occupying a leading position among practitioners of their special category, and earning considerable incomes by attending to the teeth of their adopted compatriots. More than one American dentist has been admitted to the confidence and friendship of European monarchs, and received conspicuous marks of imperial and royal favor. Some years ago an eminent dental surgeon of transatlantic origin, established in Madrid and enjoying the patronage of the Spanish court, shared with a famous Berlinese patentee of extract of malt and with a wealthy Viennese manufacturer of fireproof safes the enviable distinction of possessing the insignia of more orders of chivalry than had ever before been conferred upon any commoner. Another accomplished American dentist, who, during the Second Empire, had been a constant and ever-welcome guest at the Tuileries and Compiègne, stood gallantly by the Empress Eugénie in the day of danger, when the "déchéance" of the Napoleonic dynasty was declared shortly after the catastrophe of Sedan, and, at the risk of his own life, assisted her Majesty to escape from Paris. In far St. Petersburg, Constantinople, and Bucharest, graduates of one or another American dental college number political and social celebrities among their patients or "clients," and are received upon a footing of equality in the most exclusive circles of society. As a rule they are men of liberal education and polished manners. Their curative feats frequently border on the marvelous, for they rarely resort to extraction, except in extreme cases of decay or accidental injury, but excel in the repair of damaged teeth, and in the treatment of diseases affecting the human jaw and its ivory armament. The main object steadfastly kept in view by American dentistry appears to be the conservation of the masticating apparatus bestowed upon us by Nature. Only when that apparatus falls into a condition rendering it practically worthless for the purpose it was originally intended to fulfill, does the dental surgeon of to-day reluctantly consent to its removal, mercifully rendering that operation painless by the aid of "laughing gas" or ether spray, and promptly substituting for the discarded "râtelier" a set of artificial teeth in every respect its superior. Where the indigenous "grinder" can be saved, they spare no pains and ingenuity to preserve it, being of opinion that the worst way of dealing with a tooth is to pull it out. They are past masters in the arts of stopping, fixing loose teeth, removing injurious growths from their roots, destroying nerves, and even of extracting faulty teeth, remedying their defects, and replacing them in the jaw with such treatment of the gum as fully reinstates them in their pristine efficiency. All these and other wonders—for instance, the substitution of a perfect tooth, drawn from a healthy jaw, for a decayed tooth—are now performed by scientific dentists of all nationalities, the initiative in the majority of such surprising innovations being due, it is generally admitted, to the fertility of transatlantic inventiveness.

AMERICAN DENTAL EDUCATIONAL INSTITUTIONS.

NAME OF INSTITUTION.	ORGANIZED.	REGULAR SESSION.*	DEAN OR SECRETARY.
Baltimore College of Dental Surgery	1840	Oct.-March.	R. B. Winder, Dean, 140 Park Ave., Baltimore, Md.
Ohio College of Dental Surgery, Department of Dentistry of University of Cincinnati.	1845	Oct.-March.	H. A. Smith, Dean, 128 Garfield Pl., Cincinnati, O.
Pennsylvania College of Dental Surgery	1855	Oct.-Feb.	C. N. Peirce, Dean, 1415 Walnut St., Philadelphia, Pa.
Philadelphia Dental College	1863	Oct.-Feb.	J. E. Garretson, Dean, 1537 Chestnut St., Philadelphia, Pa.
New York College of Dentistry, University of the State of New York	1866	Oct.-March.	Frank Abbott, Dean, 22 West Fortieth St., New York, N. Y.
Missouri Dental College	1866	Sept.-March.	H. H. Mudd, Dean, 2604 Locust St., St. Louis, Mo.
Boston Dental College	1867	Oct.-June.	J. A. Follett, Dean, 219 Shawmut Ave., Boston, Mass.
Dental School of Harvard University	1869	Sept.-June.	Thos. H. Chandler, Dean, Hotel Bristol, Boston, Mass.
University of Michigan, College of Dental Surgery	1875	Oct.-June.	J. Taft, Dean, 122 West Seventh St., Cincinnati, O., or Ann Arbor, Mich.
University of Pennsylvania, Department of Dentistry	1878	Oct.-April.	Jas. Truman, Secretary, 3249 Chestnut St., Philadelphia, Pa.
Dental Department of the University of Tennessee	1878	Oct.-Feb.	Jas. Y. Crawford, Secretary, 156½ Church St., Nashville, Tenn.
Indiana Dental College	1879	Oct.-March	J. E. Cravens, Secretary, 201 N. Penn St., Indianapolis, Ind.
Vanderbilt University, Department of Dentistry	1879	Oct.-Feb.	W. H. Morgan, Dean, 12 N. High St., Nashville, Tenn.
Dental Department of the University of Maryland	1881	Oct.-March.	F. J. S. Gorgas, Dean, 259 N. Eutaw St., Baltimore, Md.
Dental Department of the State University of Iowa	1881	Oct.-Feb.	A. O. Hunt, Dean, Iowa City, Iowa.
Kansas City Dental College, Dental Department of Kansas City Medical College	1881	Sept.-March.	J. D. Patterson, Secretary, 800 Main St., Kansas City, Mo.
College of Dentistry, University of California	1881	March-Nov.	C. L. Goddard, Dean, 131 Post St., San Francisco, Cal.
Chicago College of Dental Surgery	1882	Sept.-March.	T. W. Brophy, Dean, 96 State St., Chicago, Ill.
National University, Dental Department	1884	Oct.-April.	H. H. Barker, Dean, 1116 H St., N. W., Washington, D. C.
Howard University Dental College	1884	Oct.-March.	Chas. B. Purvis, Secretary, 1118 Thirteenth St., N. W., Washington, D. C.
Northwestern Coll. of Dent. Surg., Dept. of Dent. and Oral Surg. of Lake Forest Univ.	1885	Oct.-March.	F. H. B McDowell, Secretary, 1201 Wabash Ave., Chicago, Ill.
School of Dentistry, Meharry Med. Department of Central Tennessee College	1885	Oct.-Feb.	G. W. Hubbard, Dean, Nashville, Tenn.
American College of Dental Surgery	1886	Oct.-March.	I. Cledenen, Secretary, 78 to 82 State St., Chicago, Ill.
Louisville Coll. of Dentistry, Dental Department of Central University of Kentucky	1887	Jan.-June.	Jas. Lewis Howe, Dean, 324 E. Chestnut St., Louisville, Ky.
Dental Department of the Southern Medical College	1887	Oct.-March.	L. D. Carpenter, Dean, 47½ Whitehall St., Atlanta, Ga.
Dental Department of the St. Louis College of Physicians and Surgeons	1887	Sept.-March.	Louis Bauer, Dean, 515 Pine St., St Louis, Mo.
University Dental College, Dental Department of Northwestern University	1887	Sept.-March.	J. S. Marshall, Dean, 9 Jackson St., Chicago, Ill.
Dental Department of the Columbian University	1887	Oct.-March.	A. F. A. King, Dean, 726 Thirteenth St., N. W., Washington, D. C.
College of Dental Surgery of the University of Denver, Colorado	1887	Oct.-	A. B. Robbins, Dean, 1132 Fifteenth St., Denver, Col.
College of Dentistry, Department of Medicine of the University of Minnesota	1888	Oct.-	Cyrus Northrop, Prest. of the University, Minneapolis, Minn.
Royal College of Dental Surgeons of Ontario	1868	Nov.-March.	J. B. Willmott, Secretary, Mechanics' Institute Bldg., Toronto, Canada.

* Short intermediate sessions are held by many of them, either in the spring or fall.

OBITUARY.

WILLIAM PRESCOTT FARRAR, M.D.

DIED, at Salem, Westchester county, N. Y., October 12, 1888, WILLIAM PRESCOTT FARRAR, M.D., in the sixty-sixth year of his age.

Dr. Farrar (who was a brother of Dr. J. N. Farrar, of New York City) was in early life a successful teacher of high schools in Massachusetts and New Hampshire. He entered medicine at the age of twenty-seven; graduated at Berkshire County Medical College, and subsequently attended a course of lectures at the College of Physicians and Surgeons in New York City. He then settled at Salem, where he was highly esteemed as a gentleman and skillful practitioner of medicine and dentistry. In recent years declining health caused him to retire from active practice. He leaves a wife, but no children.

PERISCOPE.

THE OSTEOGENIC FACTORS IN THE DEVELOPMENT AND REPAIR OF BONE.—Macewen ("Annals of Surgery," October, November, 1887) demonstrates that osteogenic material is contained neither in the periosteum, as has been ordinarily believed for over a century, nor in the medulla, as some modern writers have advocated, but in the osteoblasts, either embryonic or fully formed, occupying the Haversian canals and spaces as well as the subperiosteal surface and the medullary spaces of the bone itself. This conclusion he arrives at by the successive demonstration of the following propositions: "(*a*) When the periosteum has been mechanically detached from an extensive area of an adult healthy bone and replaced after the lapse of some hours, union between the bone and the periosteum can take place without sloughing or observable augmentation ensuing. (*b*) The periosteum may be separated from the bone for a period of days by inflammatory products, after the withdrawal of which reunion between the periosteum and the bone may take place without necrosis ensuing, showing that the temporary separation of the periosteum from the bone, even as a pathological result, is not necessarily attended by death of bone. (*c*) The periosteum covering a portion of bone may be completely destroyed or permanently removed, yet the denuded bone may not only retain its vitality, but may throw out cells which will cover it, and form a new periosteum. (*d*) A portion of bone which has its continuity severed on all sides, and at the same time has had all its periosteum removed, is capable of living and growing. (*e*) Not only do detached portions of bone deprived of their periosteum live when reimplanted in their original position, but such portions are capable of living after transplantation. Parts of deeper layers of bone, which had no periosteal connection, have been transplanted and have lived and grown. (*f*) The

periosteum does not initiate the reproduction of bone. Bones are subject to constant interstitial changes. (*g*) Bone may be regenerated independently of the medulla, which may itself be reproduced. (*h*) The histogenetic phenomena support the observations showing that the periosteum does not generate bone." He explains the formation of osseous plaques on the inner surface of the periosteum after subperiosteal removal of bone by supposing a certain portion of the osteoblastic layer covering the surface of the bone to be removed with the periosteum. This is very likely to happen in the majority of cases in which such removal is necessary, because upon irritation of bone there is a large increase in the number of the round cells, mainly embryonal osteoblasts, occupying the Haversian canals, so that, passing in the direction of least resistance, large numbers congregate on the surface of the bone beneath the periosteum. The periosteum, in consequence of the irritation, becomes hyperemic, softer, and more swollen, and the meshes of its lower stratum become loaded with osteoblasts. From such a center osseous nodules and plates may spring. In subperiosteal resection of the elbow-joint a series of these osseous plates is usually found adherent to the inner surface of the periosteum. If these are left *in situ* new bone forms which interferes with the motion of the joint. This, he maintains, never happens if the periosteum is subjected to a careful scrutiny and all of the bony plates removed, union by fibrous tissue taking place.—*New York Medical Journal.*

RICKETS AND SYPHILIS.—According to the *Lancet*, "Comby does not agree with Parrot's proposition that rickets only arises as the ultimate manifestation of syphilis. The 'geographical' tongue, the scarred buttocks, eroded teeth, and natiform skull are signs of an extinguished syphilis, according to Parrot and others. Hereditary syphilis attested by these marks would cause osteophytes, gelatiniform atrophy, and spongeoid tissue. which suggest rickets. Comby contrasts rickets with syphilis. In the former, rarefaction of tissue occurs; in the latter, condensation and softening. Scars and dental lesions are common in syphilis, rare in rickets; corneal lesions are generally scrofulous; lingual desquamation is not peculiar to syphilis. If infants who have been impregnated with syphilis are provided in due course with suitable food, they will not become rickety. In the etiology of rachitis, syphilis holds the same position as measles, variola, scarlatina, typhoid fever, and broncho-pneumonia."—*New York Medical Journal.*

COCAÏNE IN TOOTH EXTRACTION.—The employment of certain salts of cocaïne, and even the alkaloid itself, in dental surgery, has now received a fairly wide trial. It must be confessed that authorities here and abroad have arrived at very various results, some averring that cocaïne is in all cases successful, while others have relinquished its use. To reconcile these discordant statements is at present quite impossible; we can only indicate the best means of applying this anesthetic, and warn against its indiscriminate use. As a rule, from half a grain to a grain of the hydrochlorate dissolved in ten minims of water, and injected into the tissue of the gum by two punctures, one on the lingual and one on the buccal

aspect of the tooth, insures a painless extraction. It is best to inject very slowly, and to wait from five to ten minutes after the completion of the last injection before extracting. However, in some persons cocaïne fails entirely; nor is it possible to anticipate in whom it will succeed or in whom it will prove abortive. Simply painting the gum is valueless in tooth-extraction, except as a preliminary to the punctures of the hypodermic syringe, for some persons are as much afraid of the pain incident to the pricking the hyperemic gum as they are of the more severe operation. Although many persons experience no unpleasant effects from the injection of one grain, yet a certain proportion are painfully and alarmingly upset by its action. Syncope, extreme respiratory distress, feelings of complete prostration lasting for hours, vomiting, great nausea, facial paralysis, muscular paresis, and swelling of the tongue may ensue; thick utterance has been present in many cases; while vertigo, headache, and hallucinations are not uncommon sequelæ of cocaïne given hypodermically. As a rule, these symptoms, although very alarming at the time, pass off in a few hours, but may persist for days. Cocaïne sometimes loses its anesthetic powers after the first injection. Many do not recommend cocaïne for prolonged dental operations, preferring nitrous oxide gas, which is sure and safe, for short procedures, while others lean to a combination of the two agents.—*London Lancet.*

Dry Mouth.—At the meeting of the Clinical Society of London March 17, 1888, Dr. W. B. Haddon read a paper on dry mouth, or suppression of the salivary and buccal secretions. The patient was a woman, 65 years old, who had suffered from no affection which could throw light on her present condition. There was no history of family paralysis, or of the prolonged use of belladonna. Her mouth began to get dry some months previous to observation. The tongue was red, devoid of epithelium, cracked in all directions, like crocodile skin, and absolutely dry. The mouth generally was dry, and the mucous membrane smooth, shiny and pale, with a few patches of injection. There was also deficiency of moisture at the back of the pharynx. The tonsils were natural. The salivary glands, as far as could be made out, were natural in size. Common sensation of the inside of the mouth was unimpaired; but the sense of taste was retarded in consequence of the deficiency of moisture. When the mouth became moist later on, the saliva was found to be slightly acid, and to exert no action on a solution of starch. During this time the mouth had been getting dry, perspiration had notably diminished, and the lachrymal secretion was arrested. The patient received much benefit from the use of jaborandi. A case of similar nature under the care of Mr. Hutchinson was alluded to, and one under the care of Dr. Rowlands, of Liverpool, was communicated by the author of the paper. In conclusion, it was suggested that this condition of dry mouth was due to some disorder of the nervous apparatus.—*London Lancet.*

Catarrh of the Antrum.—In cases of catarrh of the antrum, Dr. Schiffers, of Liège, instead of extracting the second molar, gains access to the cavity through the opening in the middle meatus of the nose. Through this he inserts a director, and with the help of

a curved, probe-pointed bistoury, he opens up a passage for the free exit of the confined secretion. By the use of cocaïne, the patient suffers but little during the operation. Dr. Schiffers points out that catarrh of the antrum is frequently overlooked and mistaken for an affection of the mucous membrane of the nose. When an abundant fetid discharge runs from the nose, especially when it is intermittent, the existence of disease of the antrum should be suspected. A careful search should then be made, with the help of the nasal speculum and a good light, for the welling up of the secretion through the foramen in the middle meatus.—*London Lancet.*

United Fracture of Tooth-Roots.—Dr. Williamson, the president of the Odonto-Chirurgical Society of Scotland, exhibited recently an interesting case of fracture of the root of a central incisor, which bore evidence of having been united. There was a history of a blow in childhood, from which the right incisor received so much injury that its pulp died, as shown by its discolored appearance. But both teeth had done good service until the patient reached the age of 45, when the left central became so loose that it was removed with the fingers. A part of the root, however, was left behind; but being loose, was easily extracted. On examination, it was found that the two fragments fitted accurately when placed in apposition, except when there was a little chipping at one edge. The fracture of the dentine was at a higher level than that of the cementum, so that the latter formed a sort of collar for the lower fragment. There was some thickening in parts of the cementum, and the whole of the pulp in the coronal fragment was calcified, and also the part close to the line of fracture in the other piece. Whether there was any cemental tissue coating over the fractured surfaces, as in one of Weld's cases, was uncertain, since the specimen was not subjected to microscopical examination. Hohl, Tomes, Hyrtl, and others have altogether collected only about a dozen cases of united fractures in human teeth, and several have been met with in the tusks of animals. There seems no physiological reason why these cases should be so rare, for new cementum is capable of being formed at any period of life, and it is no uncommon occurrence for the pulp to resume its formative functions long after the cessation of regular calcification. Tomes points out that probably the difficulty of diagnosing fracture of the root leads to improper treatment, which does not give nature a chance. Moreover, a blow sufficiently violent to cause fracture would generally injure the pulp, and bring about its destruction.—*London Lancet.*

Communicability of Syphilis through the Saliva.—With regard to this, Von Ziemssen, in his recent work on Skin Diseases, says, in speaking of tattooing . . . "repeated infections with saliva have occurred, in consequence of the habit of moistening the needle with saliva so as to make the pigment stick." It is not, I presume, to be inferred from this that in every case of constitutional syphilis the saliva is infective, but rather that, in all case where the disease has been communicated through the saliva, "mucous patches" exist either on the mucous membrane of the mouth or on the tongue, the "highly contagious" secretion from which, mingled with the

saliva, is directly inoculated.—*D. Leckie, M.B., in British Medical Journal.*

There is at present an exactly similar case to that described by Surgeon Porter under my care in the Station Hospital, Glencorse, except that the tattooing was done on both forearms, and on each forearm there is a large chancre, about the size of half a crown. In this case the axillary glands on the left side became inflamed, and suppurated, from the primary irritation, before there were any local signs. Both men, privates in the Seaforth Highlanders, were in hospital together,—the one with well-marked tertiary symptoms, since discharged; the other, his victim, a robust young soldier, who never had venereal disease in his life before, still remains under treatment. The same process of communication was shown to have taken place, the operator having spat upon the punctured part during the tattooing. No doubt was entertained as to the nature of the disease when the history was ascertained. The sores are healing kindly under specific treatment. Such evidence of communicability through the saliva points to measures of prophylaxis.—*P. M. Carleton, M.D., in British Medical Journal.*

Anomalous Ducts of Exit from Parotid Glands.—I was called to see the children of Mr. D., a very wealthy farmer, six miles distant in the country. I examined his children (four in number), and found that three of them have a small orifice on each side and just in front of the upper portion of the external ear, and that one has only one opening in front of the left ear, and that there is a continuous discharge going on through these orifices all the time. On close investigation I diagnosed these openings to be the mouths of small ducts leading from the parotid glands, and that, instead of the secretions being poured out through Steno's ducts at the proper place, they are discharged through these ducts externally, just in front of the external ear. Mr. D. has three children that have not this abnormality, but he has a brother-in-law (a brother to Mrs. D.) who has two children that have the like ducts discharging externally,—making in all six cases, four males and two females, in the same family.

I find that whenever the excretions from the parotid glands through these ducts come in contact with the air, in very cold weather, and when the mouths of the ducts are not kept clear and open to give free exit to the glandular secretions, the secretions accumulate in the ducts and produce glandular irritation, and, when opened externally, discharge a very purulent excretion. I opened up two of the ducts, in each of two of the children, which were blocked up, and these discharged considerably. I probed two of the ducts with a small silver probe, and found that they led directly into the parotid glands.

I advised the parents to keep the ducts open to give constant and free exit to the secretions, and they have no trouble when this is done; and the discharge, when constantly going on, is so small that it is seldom noticed when kept clean.

The family record is unquestionably good through a long line of ancestry, and there is not a shade of heredity in the etiology of these cases.—*D. M. Crossman, M.D., in Virginia Medical Monthly.*

Multiple Salivary Calculi.—Dr. Nikolai J. Moïsëëff, of Shtshigry, reports (*Proceedings of the Shtshigry Medical Society*, 1887, vol. i, p. 68) the case of a retired major-general, aged 70, who sought his advice on account of incessant profuse salivation, pain on deglutition, and sublingual swelling of several years' standing. An oblong, hard elevation was found along the course of Bartholin's duct, which, even on slight pressure, gave the finger a distinct grating sensation. The duct was considerably distended along its whole course, and contained three salivary calculi lying in close contact. The nearest and smallest concretion, of the size of a big pea, was easily removed with forceps, but the other two could be extracted only after slitting up the duct, since they were considerably larger, especially the deepest one, which measured three-fourths of an inch in length and three-eighths in breadth, and, in addition, was intimately adherent to the gland substance; it resembled a bird's bill in shape. When dry it weighed 33 grains, and consisted of a comparatively hard and compact nucleus, with a spongy, friable outer capsule. The smallest calculus was of a pyramidal form, of spongy consistence, and a grayish-yellow color, while the middle one was quadrangular, with rounded angles, and of a distinctly laminated structure. The total weight of the dried calculi was 38 grains. The wound healed well in a week. Dr. Moïsëëff has been unable to find another recorded instance of multiple calculi simultaneously present in the same salivary duct.—*British Medical Journal.*

An Antiseptic Gargle.—The *Union Médicale* credits Muller with the following formula:

Thymol, 3½ grains;
Benzoic acid, 45 grains;
Tincture of eucalyptus, 180 grains;
Water, 11,250 grains.

At bedtime the teeth are to be cleaned with powdered soap and a brush, and then the mouth can be rapidly sterilized by gargling for half a minute or a minute with the solution.—*New York Medical Journal.*

Abscess in the Middle Ear mistaken for Toothache.—Early in February a young man had what he took to be toothache on the right side of the upper jaw. He consulted a dentist, who could find nothing wrong with the teeth and referred him to me. On examination I found a well-marked abscess in the right drum. The upper back portion of the membrane was bulged outwards to the extent of a pea. When punctured, pus escaped at once, and when air was blown through the drum considerable more was forced out out of it. I need hardly add that this promptly relieved the "toothache." Reflex irritation between the teeth and the ear is usually from the former to the latter. In this case the usual order was reversed.—*A. D. Williams, M.D., in St. Louis Medical and Surgical Journal.*

Pyorrhea Alveolitis in the Elephant.—Mr. Edwards has confided to me for examination a molar of an Asiatic elephant, fallen spontaneously. This tooth was intact, at least in appearance, a

fraction of the root having been taken off for examination. It weighed in its dry state 1 kil. .972. The root was covered with a crust of calcareous aspect, of variable thickness, but exceeding at certain points 3 or 4 millimeters. The inferior extremity of the root seemed to have been the seat of an intense pathological process and presented sharp prominences, incompatible with the normal state. We have verified by direct examination, as well as by microscopical, that the calcareous crust covering the root was constituted by the salivary tartar, that is to say, by the micro-organisms having provoked the deposit of calcareous salts held in solution in the saliva. The examination of the lesions has been made comparatively with those of a tooth-root of a large molar of an elephant, reputed healthy. The cementum presented all the degrees of alteration, from the most superficial to their entire disappearance: not only were there micro-organisms on the surface, but they had penetrated into the whole extent of its thickness. In the points where the dentine had been exposed, there were found in the creases, more or less deep, a covering of micro-organisms, more or less compact, with irregular outlines. These micro-organisms had penetrated the canaliculi, and it is possible had penetrated into the depths of the dentine. The lesions did not differ in any degree from those observed in man, and present with them a striking similarity.

We conclude then the Asian Elephant in captivity may be attacked with the same malady which has been described in man under the name of infectious gingivitis (*pyorrhea alveolitis*).—*Pacific Record of Medicine and Surgery.*

Tumor of Superior Maxilla.—Mr. Augustus Clay showed a tumor the size of a hen's egg, which he had removed by enucleation from the antrum. There was a history of incessant toothache on that side for four years. Twelve months before the operation a swelling the size of a marble appeared at the upper part of the gum. In six months this had grown rather rapidly, and bulged out the cheek in the usual characteristic manner. The other cavities were not encroached upon. An exploratory puncture was made, and a piece removed for microscopic examination; it was found to be a simple fibroma. A week later the growth was turned out of the antrum, after a small skin incision and an opening through the thin bony wall had been made. The patient was discharged on the nineteenth day after the operation, and up to the present time (twelve months) there has been no recurrence.—*Reports of Midland Medical Society, in London Lancet.*

Intra-Uterine Dentition.—In the *Boletin Clinico* of Lerida, Señor Lorens mentions a case of intra-uterine dentition. He recently attended a woman in humble circumstances in Barcelona during a premature confinement at six months. The child had already cut the four incisors and the two lower canines. Had the woman gone her full time the dentition would have probably been much further advanced.—*London Lancet.*

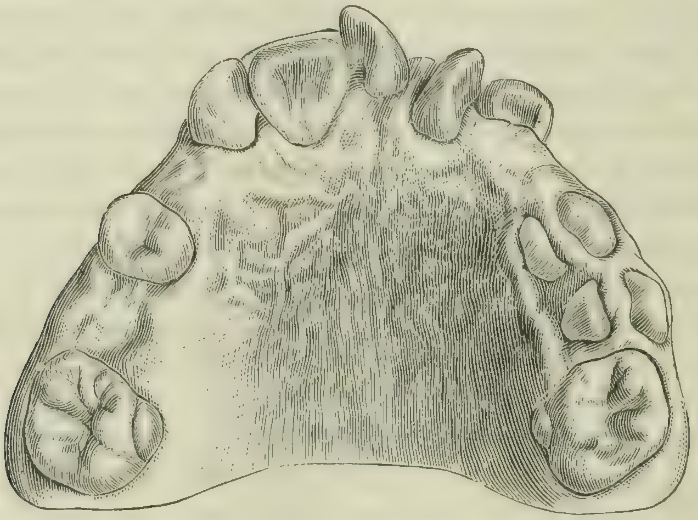
HINTS AND QUERIES.

Dentition Aided by the Lancet —Dr. James W. White, in a monograph on "Diseases Incident to the First Dentition" ("American System of Dentistry," third volume, page 326), says, "But the direct pressure of the advancing tooth upon the fibrous integuments is not the only nor the principal factor in disturbance of equilibrium in pathological dentition. The most serious complications are, it is reasonable to suppose, caused by the resistance of the gums, and consequent pressure upon the nervous and vascular supply of the pulp, giving rise to severe and unremitting pain—a true toothache, comparable only to that exquisite torture which is experienced in after-life from an exposed and irritated pulp. The condition when a tooth is thus situated is not unlike that which is found in whitlow,—vascular and sensitive tissues bound down by unyielding coverings If such a perversion of this physiological process is possible, there can be no question as to the extent of the mischief which may result,—an irritability of the general system which finds expression in loss of appetite, sleeplessness, nausea, thirst, fever, diarrhœa or constipation, convulsions, paralysis, and other serious lesions, many of which, as strabismus or epilepsy, remain through life. . . . It must be remembered that at the period of eruption the roots of the teeth are yet incomplete. Instead of the conical termination and minute foramen which characterize a perfected tooth, the aperture is nearly as large as the root itself, and thus, when the sensitive pulp, made up of connective tissue, blood-vessels, and nerves, is in a condition of irritation because of the morbid activity of the process of dentition,—augmented vascular and nervous action,—there may be produced a hyperemia sufficient, possibly, to cause the protrusion of a part of the mass from the incomplete aperture of the root, giving abundant cause for extreme constitutional disturbance. . . . That this resistance of the gum-tissue is the occasion of the constitutional disturbance so often seen in teething children appears probable in view of those cases in which, though there be no local indication of trouble, every untoward symptom disappears promptly after lancing of the gums over the tooth or teeth next in order of eruption. It is almost demonstrated, negatively by the inefficiency of hygienic measures and of systemic medication, by failure to produce relief by scoring the gums (a practice which has brought the lancet into undeserved disrepute), and positively by the immediate, apparent, almost magical improvement which follows the removal of the cause, viz., the pressure of the fibrous tissue upon the advancing tooth and its nervous supply. This theory makes it easy to understand how the thorough lancing of the gums over the tooth or teeth thus situated may give a relief so immediate and complete that there shall be no room for doubt as to the correctness of the diagnosis."

Dr. White furthermore says, page 331, "Partial eruption of a tooth is generally accepted as a solution of the problem, the slightest presentation being considered as definitely deciding against the necessity for lancing. This is generally true in the case of the incisors—far from true of the cuspids and molars. The cone shape of the cuspids insures a persistence of the trouble, from pressure of the inclosing ring of gum, until fully erupted. A complete severance of this fibrous ring on the anterior and posterior as well as lateral surfaces is indicated, and is even more necessary than before the partial eruption of the tooth. A cuspid is indeed rarely the cause of irritation until after the eruption of its point. All the cusps of a molar may have erupted, and yet strong bands of fibrous integument maintain a resistance as decided as before their appearance. In this case either

the boundaries of the tooth should be traced by the lancet, and all such bands severed around its outlines, or a crucial incision should be made so as to insure perfect release from pressure. In extreme or urgent cases it is sometimes advisable to seize the gum over a presenting molar with a tenaculum and cut out a square block of gum, so as to expose the whole articulating surface of the tooth."

The illustration represents a plaster cast from an impression taken for the purpose of correcting the irregularity occasioned by the presence of two superior left



central incisors, the extraction of the distal central having been previously determined upon, by Dr. E. C. Kirk, who subsequently completed the regulating operation, and who kindly furnished the cast to the writer. It is here produced as an exceptionally fine illustration of the "strong bands" alluded to in the description by Dr. White. It will be observed that the left bicuspids are in process of erupting, and that both of them are held back by bands of gum-tissue obviously capable, under ordinary circumstances, of producing retroactively irritations of the dental pulps sufficient to set in motion the whole train of morbific activities referred to. There can be no reasonable doubt that the cutting of such bands would instantly have removed the pressure from the pulp, and caused a prompt cessation of whatever distressing sensations might have been thereby occasioned.

These extracts and the illustration suffice for the purpose of emphasizing the importance in many cases of a free employment of the lancet. There can be no doubt that dangerous diseases and loss of life in many cases are fairly attributable to professional ignorance of just such conditions as are shown in the cut. The subject is worthy of the most careful consideration by physicians, dentists, and parents.—W. S. H.

Pulp-Canal Points of Wood with Gutta-percha.—After the canal has been properly prepared, its length is to be measured by a broach pushed through a little disk cut from a piece of rubber-dam. Select a wood point that will fit loosely in the canal, make or see that the end of the point is blunt, or squared, and mark its length one-eighth inch shorter than the broach and disk measure. Have at hand some very thin sheets of gutta-percha made by putting a little glycerin on a clean glass, wiping off the glycerin, and pouring some chloro-percha that will soon form a thin sheet which when dried can be used as follows: Dip the wood in chloro-percha about one-half its length from the end to the mark; warm carefully a piece of the sheet gutta-percha and wrap it on the wood so that the gutta-percha shall extend in a sharp point a little beyond the end of the wood.

Keep all warm without scorching until you have rolled on the wood enough gutta-percha to fill the canal, and then press it home in the tooth. After waiting a few minutes and blowing cold air into the cavity, twist off the wood, and thus leave a very small portion of the wood imbedded in the gutta-percha, which will perfectly seal the foramen and fill half the length of the canal.

If the foraminal opening is large, as in teeth not fully developed, moisten the canal with creasote or dilute carbolic acid, and with a little excess of gutta-percha on the wood point prepared as before and quite warm, take an impression which, when withdrawn, will serve as a guide in preparing another point to be inserted just far enough for the permanent filling of the canal without protruding beyond the foramen. A pulp-canal impression thus taken is very exact, and shows so plainly the foraminal portion and its distance from the cervical opening that the gutta-percha-covered wood point can be made precisely long enough and thick enough to exactly fill the canal.—B. Q. STEVENS, Hannibal, Mo.

TO THE EDITOR OF THE DENTAL COSMOS:

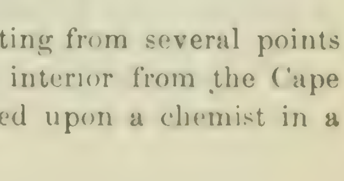
In the discussions of the New York Odontological Society as published in the September issue of the DENTAL COSMOS, Dr. Clowes asserts in italics, as though an established rule, that "whenever two teeth are found naturally apart, they are sound and will remain so," etc.

Let me give an exception to the rule. In October last one of my patrons sent his daughter, aged about twenty, to me. I found between the two centrals, the centrals and laterals, and right laterals and cuspid, space sufficient to freely pass a No. 2 separating file. And in the teeth mentioned were *seven approximal cavities*. The other teeth are in actual contact, although not crowded, and are entirely free from decay, with the exception of one approximal and two crown cavities in lower first molars.—H. T. KING, Fremont, Neb.

TO THE EDITOR OF THE DENTAL COSMOS:

SIR: In the Hints and Queries of the August number of the DENTAL COSMOS Dr. T. F. Chupein relates his failure to obtain a good cast from pumice and glycerin. He used too much glycerin. I have never tried pumice-stone, but marble-dust and glycerin (about four ounces of glycerin to a quart of marble-dust) takes a beautiful cast. Care must be exercised not to have the metal too hot and not to pour it directly on the palatine surface. I take a piece of sheet iron and guide the melted metal into the mold. I have been using marble-dust and glycerin for a long time, and like it much better than anything else that I have ever tried,—in fact, can find no fault with it.—CHARLES P. GROUT, New York, N. Y.

LOGAN CROWN GRINDER.—Some one during the meeting of the Southern Dental Association at Old Point Comfort, Va., in August, 1888, presumably Dr. G. S. Staples, of Sherman, Texas, described his method of grinding Logan tooth crowns substantially as follows: Take a hollow mandrel like No. 305, and while in the hand-piece heat the end and mount on it a corundum wheel such as No. 00, being careful to make its outer face run true. The neck of a Logan crown can then be ground without any risk of grinding the post, which enters and is protected by the smooth socket of the mandrel.—W. S. H.



DOMESTIC DENTISTRY.—The following case is interesting from several points of view. A lady living at quite a distance in the interior from the Cape of Good Hope, while suffering from the toothache called upon a chemist in a

neighboring town, who managed to extract two teeth simultaneously; one of them being perfectly sound. A few months subsequently the lady was suffering from another tooth, but, disgusted with her previous experience, concluded to be her own dentist. She therefore obtained some mercury, filed away an English shilling piece, scraped out the large cavity in an upper molar, washed it out repeatedly with soap and water, dried it as well as she could, and filled the cavity with the amalgam.

Twenty years have since elapsed without any suffering from that tooth, which I have examined recently, and with the exception of its rather black color the filling is still perfect.—F. W. CONROTH, Boulogne sur Mer, France.

SCURVY.—Dr. Frederick P. Henry, in a lecture upon this subject at the Philadelphia Hospital, gave the following intelligent summary, which I venture to send for publication.—E. H. L.

"If diseases were divided into preventable and non-preventable, scurvy would certainly head the list of the former, for there is none concerning the prophylaxis of which we have more certain rules. Without entering into particulars, which may be readily inferred from what I have said of the causes of this disease, it may be asserted that scurvy will never make its appearance, either in laboring or idle men, who are supplied with plenty of nutritious food. From an anti-scorbutic stand-point, no single article of food can be compared with the potato. In the treatment of the disease itself, immediate attention should be paid to the gums; for, until they are in a comparatively healthy state, the first two steps in the digestion of solid food, mastication and insalivation, cannot be taken. While life may be supported indefinitely by milk, eggs, and soup, such life is not one of hard work. Solid food is the prerequisite of solid work. Gargles of solutions of potassium chloride and tincture of myrrh will be found of service; also, painting the gums with strong solutions of nitrate of silver, or with the solid stick. The strong fetor of the breath may be corrected by adding carbolic acid to the mouth-wash. Two or three grains to the ounce will be sufficient. Internally, lemon-juice should be administered. One of our patients has greatly improved while consuming six lemons daily. If iron is tolerated, it may be administered in the form of Blaud's pill, which contains potassium as well as iron."

LOCAL ANESTHETIC.—I have used the subjoined formula as a local anesthetic successfully in my practice for more than a year:

℞ Acid. carbolic., gtt. v;
Chloral hydrat., gr. v;
Cocaïne hydrochlor., gr. viij;
Aqua dest., f℥ iij.

A few drops of this solution hypodermically injected deep into the tissues about the alveolus of the tooth to be extracted will prevent all pain.—A. SUNDT, D.D.S., Galveston, Texas.

SHOULD patients be instructed to wear their artificial teeth during sleep, or to remove the same? Will those answering the above please give their reasons pro and con?—F. E.

BABBITT-METAL.—If Babbitt-metal does not pour readily, or is brittle, add a little tin.—L. P. HASKELL.

THE

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ORIGINAL COMMUNICATIONS.

DENTAL LEGISLATION.

BY DR. G. S. DEAN, SAN FRANCISCO, CAL.

I.—THE PRESENT FACT.

DR. SHUMWAY* has dared to come forward with a protest against our present legislation concerning the practice of dentistry. He stood alone; he knew beforehand that he would stand alone. And he was met, as he undoubtedly knew that he would be met,—as the protestant is always met,—by the sil nce of scorn, the sneer, or the arrogant assertion of might and hostile intention. He was met by no argument; protestants must not expect to be reasoned with. He was simply ostracized.

Under these circumstances, I cannot leave Dr. Shumway to stand alone. I may not agree with him in all things. But I must take my stand with him as a protestant.

Let me open with a plea for protestants,—a word in favor of protestants in general,—a presentation of the fact that the world would be the gainer by rationally considering their statements, instead of, as now, irrationally abusing, excommunicating, and trampling under foot. Perhaps I may speak feelingly here. For I am myself, in most matters, a heretic. I am the son of a heretic, the grandson of a heretic,—the heretical descendant of a long line of heretics. My ancestors were driven out of Europe for heresy. And I have observed that Europe has eventually come round and accepted the heretical doctrines for the holding of which it exiled my ancestors—and has found welfare in so doing. Nor is this an isolated instance. Truth, when first presented, is always "crushed to earth,"—either by

* See report of proceedings First District Dental Society, State of New York: DENTAL COSMOS, January, 1888, page 51.

apathy, or, more commonly, by persecution. In a word, majorities are usually fanatical, and *always wrong*.

This assertion may be startling. But it is neither new nor original. It was made more than eighteen centuries ago: "Enter ye in at the strait gate; for wide is the gate and broad is the way which leadeth to destruction, and many there be which go in thereat: because strait is the gate and narrow the way which leadeth unto life, and few there be that find it."

At the present time, the majority, amounting to at least four-fifths of the human race, follows Buddha or Mohammed, or worships sticks and stones, or prostrates itself before human or bestial gods or goddesses. And what is true in theology, is true in other matters. Majorities are wrong in everything. The boatman-majority burned the first steamboat The printer-majority wrecked power-presses. The weaver-majority broke up the machinery which destroyed their "home industry." In fact, the history of material progress is, throughout, a record of the triumph of the minority,—the protestants. And this progress would have been impossible if the various majorities had not been disunited,—would have been crushed if there had been a general union of the hostile majorities.

As with regard to material progress, so with regard to exchange, the basis of that progress. Here likewise majorities are wrong. Most countries have internal trade-restrictions,—impediments which obstruct the free flow of internal exchange. And, except England, no nation has liberty of trade with foreign countries; while, in England itself, internal exchange is hampered by transfer-taxes, and the freedom of external exchange is due to an accident in the first instance, and, in the second place, to a restriction of the franchise.

Everywhere the majority wants to destroy exchange, as it has desired to destroy other labor-saving devices—in order to "encourage industry." And everywhere the little minority of scientific politicians regards the majority with sorrow—with pity, not always perhaps unmingled with contempt.

"Why," says the scientific politician, "do you want 'industry'? So long as you get *goods*, what do you care for industry? Is industry in itself a blessing? If it is, then burn down your Patent Office and destroy your labor saving machinery,—that is, your industry-avoiding machinery. If this proceeding does not give you all the industry—all the hard work—you want, cut off one of your hands." As to trade, he says, "Why hamper trade? All the labor-saving machines of the world have saved less labor—that is, have abrogated less industry—have done less for the welfare of mankind—than trade. Trade—extended trade—it is this which elevates man above the brutes. Trade—it is the foundation of society, the

basis of peace. It stands alone as the civilizer, the enlightener. It is the basis of the division of labor, of human efficiency, of man's dominion over the globe. Destroy your labor-saving inventions if you will; but do not hamper *trade*."

He is met by a "leader" of the majority,—a standard-bearer—a natural politician, who requires no education—a natural-born statesman, who drank in political wisdom with his mother's milk—a political street-corner patent-medicine vender, who, like the original web-footed quack, has never extended his vision beyond the limits of the little mud-pond in which his small life is passed,—a man of great influence, who, pompous with the arrogance of ignorance, knows all about it. He is met and refuted with an ostentatious argument showing that our interest requires a clipping of the wings of our customers,—curtailment of their liberty,—restriction of their freedom to trade with whom they will.

Away, slight man! The scientific politician looks down upon you, —regards you as the scientific navigator regards the Fiji Islander who demonstrates to him that the earth is flat: If it were round, the people on the other side would fall off.

Here is the fundamental fault of our dental legislation. Not a syllable of it is dictated by the professional politician—the scientific politician—the genuine politician. It is, from beginning to end, empirical. It is not founded on first principles. It rests on a flimsy basis of superficial argument.

It may be beneficial to the nation, or it may be the reverse. This is a matter which I shall not here consider. All which I now say is that, if beneficial, it is as quack-medicines are sometimes beneficial—by accident. In other words, the legislation is not rational; it springs, not from knowledge, but from ignorance; it is the child, not of full comprehension, but of shallow plausibility. The arguments by which it is supported are on a par with those of the Fiji Islander or the opponent of labor saving machinery,—are, in fact, twin brothers to those which are universally adduced in favor of tariffs, transfer-taxes, and other restrictions on trade.

So much for the intellectual basis of our present legislation. It is shallow. What now is the emotional basis? What is the motive which induces the American public to demand dental laws? Is it indeed the *public* which demands them? Or does the public merely submit to them with a groan, regarding them as hostile to the spirit of our institutions, but of too little importance to be worth contesting?

It may perhaps be that, in some of our States, the people arose in their might, and demanded of their representatives protection from—the results of their own stupidity. It may perhaps be that,

in some of our political organizations, there was truth in the assertion: "The people do enact." In California, however, it was not so. Here the people did *not* enact. Here the people took no interest at all in the matter. Here the *people* did not want any dental law, —evidently considered that they were quite comfortable without a dental law, and were abundantly able to take care of themselves. The demand for a law came from the *dentists!*

In a word, the history of dental legislation in California is precisely the history of "trade" legislation in general. A private interest came before the legislative body and asked for "protection:" there was no opposing private interest; the great public interest was unrepresented. The result? It goes without saying.

Said some legislators, a few years ago (I quote from memory): "No adverse interest appeared before your committee. No one opposed this restriction on the citizen's liberty,—that is to say, no one worth speaking of. There were, indeed, a few so called 'political economists,' who wished that the citizen should be left unfettered. But these eccentric creatures represented nobody,—were solicitous for no particular interest. They merely took their stand on general principles, and sought only an invisible and intangible public good."

Here we see the origin of law. A private interest, desiring "protection," appeals to a body of ignorant men,—*politically* ignorant men,—narrow-minded men, too, for the most part. It easily convinces them, by shallow arguments; the most potent of these arguments being: "Some other legislature has taken the initial step—has enacted a similar law." A punctilious legislator objects to some trifling detail; the triviality is amended to suit his nice ideas, and the bill receives the legislative *esto*. This is the history of law! It is plain that, so long as we continue to construct legislators out of this sort of timber, so long must safety be sought in *laissez faire*.

At the present time, every profession, every trade—everybody, in fact—is clamoring to the legislature for "protection." What is the motive of this clamor? It will be best shown by contrast. Incomparably the most important of the professions is the profession of politics. Compared with this, dentistry, medicine—all other professions—shrink into insignificance. If the public needs good dentistry, incomparably more does it need good legislation. If the nation needs to be protected against the results of dental quackery, incomparably more does it need to be protected against the results of political quackery. Suppose, now, that I draw up a petition "to secure the better education of"—*legislators*. Who will sign it? Who will leave his business to carry it round and solicit signatures? Who will spend time and money in traveling to the capital, remaining there for days, and "working" to secure the requisite amendment?

No one. Not a living soul. Men may be convinced that the national welfare would be subserved by better legislation—by the better education of legislators. They may be fully satisfied that the law-making assembly ought to know more about political science than the Congregation of the Index knew about astronomy. They may blush at the shallow books and shallower speeches of members of our legislative bodies, local and national. They may have felt, and have winced under, the comparison which likens the political organization to an Arabian caravan—led by an unladen ass. But they will not stir. Why? Because this is a matter which concerns the *public*. It does not directly affect their private interests.

So much for what men will not do. Turn now to what they do. Shortly since, I was conversing with some gentlemen, when a man came in and solicited signatures to a petition. "Hold," said I, "before entering into the merits of your subject, answer one question: Who pays the bills for this petition?" "Who pays?" "Yes. Who pays? You have a beautiful subscription-book. It is large, is handsomely designed, is printed on costly paper, and is elegantly bound. It has cost money,—a good deal of money. Your time, too, costs money. When I see so much expenditure, I suspect that there is a sinister motive,—that somebody has 'an axe to grind.' You say that you want an irrigation-law. For whose benefit? Has not the Supreme Court just decided the question of water-rights, in a case wherein certain rich men were interested? Are you, then, hired by the defeated party to overturn the decision of the court? Are you awaking the clamor for 'judges who will decide according to our wishes'? Are you instigating the act which took the appointment of the English judiciary out of the hands of the English king, and which will in time take the appointment of the American judiciary out of the hands of the American people? Are you taking an appeal from the court to the mob,—the ignorant mob, which knows nothing of the merits of the case, and is afflicted with congenital inability to think? Such signatures as I see on your book do not impress me favorably; they do not appear to have come from men of profound erudition. Elegance of penmanship and perfection of orthography seem to have been considered unnecessary in their production. They look as if they were written with a fork. In contrast with the elegance of your outfit, which suggests the millionaire paymaster, the inelegance of your signatures suggests the dupe,—the unsophisticated workingman, deluded by you in order to dupe the equally unsophisticated legislature. There is a suspicious look about your whole proceeding. And you will get here no signatures, nor even any attention, until you have given a satisfactory answer to my preliminary question: *Who pays?*"

Did the man reply frankly to my inquiry? Did he say that he and his co-laborers furnished the money,—being actuated by an unselfish desire for the welfare of the nation? No. He did not reply at all. He sought to dodge the question—to change the subject. Then he sought to eliminate me from the assembly. Finally he departed discomfited. And, to this day, I do not know who paid the bills for that petition.

Contrast now these two cases. In one matter, nobody stirs. "Everybody's business is nobody's business." In the other, there is great activity, lavish expenditure, pertinacious earnestness. Is it not evident that, while the one matter relates to the public good, the other is a personal affair of dollars and cents—an affair of private interest?

Here, then, we have the motive of private legislation in general, and of dental legislation in particular. It is private interest. It is the "axe to grind."

Says Paul, "I could wish myself accursed from Christ for my brethren, my kindred according to the flesh, who are Israelites." Says Dr. Brown, "We want dental laws,—don't want that student to take away patients,—want a law passed for our protection."

The motive of Paul and the motive of Dr. Brown are two different motives. Paul seeks the public good. Dr. Brown seeks "to have things comfortable"—for Dr. Brown. The spirit which animates Paul is public spirit. The spirit which animates Dr. Brown is—shall I name it? Well, it is *selfishness*.

II.—The True Basis.

In order to arrive at truth, it is indispensable that we should rise above selfishness. We must strip ourselves of our prejudices, and prepare ourselves to see with our intellects instead of with our feelings,—with our heads instead of with our hearts. We must come with blank minds, prepared to receive, as truth, all which is true.

Having removed the scales of prejudice from our eyes—having risen above the turmoil of the battle of life—having ceased to be dentists and become disinterested observers—we are ready to "see ourselves as others see us;" are ready to see, not what we *want* to see, but the cold fact which is—the *truth*.

We are ready for more than this,—are ready to see, not only whether the nation will obtain better dentistry as a result of dental legislation, but also what will be the general effects of this legislation on the body politic. In other words, viewing the subject without prejudice, from the stand-point of the external observer, we are in position to see, not merely truth, but the *whole* truth.

Yet something further is needed. In order to see correctly, we must see *systematically*. A few haphazard glances, at this and that

branch of the subject, may prove more misleading than total ignorance.

> "A little learning is a dangerous thing;
> Drink deep, or taste not the Pierian spring."

We must not be content with superficial observation,—with a little learning. We must go to the bottom of the subject. And, in order to do this, we must proceed systematically. We must follow a method which will infallibly lead (like the rule for the division of fractions) to the result which we seek, namely: a map of the subject, complete as a whole, and trustworthy in detail,—a guide of action.

This method will plainly be: Look first at the political entity as a whole; then, by successive divisions and subdivisions,—analysis,—obtain an understanding of its parts and of the relations of these parts.

This is not the place for a treatise on logical procedure, but one more item relating to the method of correct mental vision must be mentioned. As the mental eye is single, only one subject should be presented to it at a time. And as its scope of clear vision is limited, that subject should be presented in a compact form,—should be rendered graspable. It results that the practical means of investigation should be that which men instinctively adopt, and which will undoubtedly be the central pillar of the logic of the future, but which is absolutely ignored by the logic of the present,—namely, a reduction of the subject to its simplest form, and an examination of it under that form; in a word, an appeal to the extreme case.

"Suppose an extreme case," says Secchi, entering on an investigation of the atomic constitution of matter; "suppose the collision of two atoms endowed solely with translation." As a mathematician, he instinctively employs the means to mathematical truth. And the essential of mathematical investigation is the essential of all investigation.

So much by way of introduction,—an introduction which is unfortunately rendered necessary by the fact that the schools do not teach the principal item which they ought to teach,—the method of study. We now turn to the actual investigation of our subject. We will proceed at once to employ that which we have seen to be the necessary instrument of investigation,—the mental microscope—the "extreme case."

"Turn to the yeast-plant," says Dr. Black in his keenly logical work on "The Formation of Poisons by Micro-Organisms;" "here we have no blood-streams to interfere with our study of phenomena." Or, to transpose Dr. Black's language into the phraseology which has been here employed,—the saccharomyces is an "extreme case"—

a naked presentation of uncomplicated truth; to the saccharomyces, therefore, let us go. According to Dr. Black, this creature is unable to live alone. As an isolated coal cannot burn, because it requires the heat of other coals for the support of its combustion, so an isolated yeast-plant cannot live, because it requires the services of others for the support of its life. Consequently, this creature is always found in swarms, companies, societies.

Here we have the fundamental truth of politics, naked, unencumbered, with "no blood-streams to interfere with our study." *Væ soli.* The members of societies have need of one another. They cannot live alone,—or, at least, they find greater happiness in the social state. Having got this general truth clearly before us, we may divide (analyze) well-being into enjoyment and means to enjoyment,—pleasure and material good,—whence result, in conscious life, the disinterested love of society, and the interested motive to social life.

We now pass from the "extreme case" which presents the fundamental truth, to secondary extreme cases which illustrate secondary truths.

Our knowledge of the habits of fishes is somewhat limited. But we know that there are unsocial fishes, and that there are social fishes. Some fishes act independently; others go in shoals. The cause of this difference in conduct is plainly a difference in impulse, unconnected with any ulterior purpose or interested motive. These fishes act thus because they like to do so. Some have no "affinity" for others of their kind; some have a temporary sexual affinity; others have a permanent general affinity.

Turning to birds, we find the interested motive. Parent birds habitually drive their offspring from their feeding-grounds as soon as the offspring are old enough to shift for themselves. On the other hand, crows, blackbirds, titmice, snowbirds, and many others, go in flocks; and, in the case of these gregarious birds, we generally find that their food is located in considerable masses, separated by wide intervals of barrenness,—wherefore the individual birds profit by having the eyes of the whole flock at their service. It is not probable that there is a *conscious* purpose in the greater part of either the antagonistic or the social conduct of birds; most of it is probably due, like that of fishes, to unreasoning impulse,—is on a par with the instinct of migration, which is said to sometimes rise to such a pitch of orgasmic excitement that the bird, if confined, will beat itself to death against the bars of its cage. But, whether the "purpose" be present or absent, there is plainly an object gained by expelling rivals or competitors on the one hand, and, on the other, by securing allies;—by unsociality on the one hand, by sociality on the other.

Here, then, we have the two great facts which underlie gregarious life: First, a disinterested desire for *society;* second, an interested desire for *alliance.*

Going now to the ant, that we may "consider her ways and be wise," we come upon further truth. Here we have the "extreme case" of caste or division of labor. We find the reproductive function located in a single individual. We find other functions similarly isolated,—individuals specialized for different duties—workers and soldiers; and here we find slaves captured in war, and other insects kept as cattle. The parallel between the ant-hill and the caste nation of Africa or Asia is curiously complete. Caste introduces a fact which we have hitherto overlooked, namely: *difference* between the different members of a social aggregate. And, by contrast, difference introduces its antithesis,—namely, *similarity* between the members. Until now. the general fact has been similarity or likeness; but, because of lack of contrast, this was unseen. Now, seeing it, and accepting it as the basis of sociality, we see also the converse fact that unlikeness is a necessary social fact, and that this unlikeness is the basis of the second truth of gregarious life—of alliance. In a word, we find that there are two ultimate social facts,—*likeness,* the basis of *sympathy; unlikeness,* the basis of *alliance.*

Turning next to a village of ground-squirrels, we hear, as we approach, the warning voice of the sentinel—"kree-kree." The other squirrels continue to feed, apparently unconcerned. We approach a little nearer—"kree-kree." The squirrel-village continues its labors, calm and secure. We advance again—"kree-ke-ree-ke-ree." Instantly every squirrel abandons his toil, and seeks safety in his hole.

Here we have another political fact. Language? Yes, certainly; but something more than this. Difference of social function, not dependent, as in the ant-hill, on difference of morphological structure? Yes; this certainly; but something more than this. We have here the *sentinel.* That is to say, we have, apart from union or alliance in pursuit of food, another kind of union,—an alliance in opposition to creatures which desire to prey on members of the community. We have union for defence against the enemy.

In result, then, we have three basal facts of politics. Of these the first is similarity, resulting in sympathy. The second is difference, resulting in alliance. The third is the enemy, resulting in defence.

That portion of politics with which we have most concern is alliance—offensive and defensive. We must recognize sympathy as the underlying fact, never to be ignored. But we must limit our examination to the other branch of the subject. This we must consider more in detail.

Our consideration of the conduct of birds has given us a prelim-

inary general view of the conditions under which arise antagonism on the one hand, alliance on the other. Rivalry or competition gives birth to antagonism or enmity; whether the biped is feathered or featherless, "two of a trade can never agree." On the other hand, mutual serviceableness gives rise to alliance, to mutual service, to *exchange*.

Where is the exchange in a society of microbes? Each throws his peptic secretion into the common fund—the community property. Each exchanges his digestive labor for a like service on the part of his companions. Where is the exchange in a flock of titmice? Each seeks food and chirps when he finds it. Each exchanges the use of his eyes for a like use of the eyes of his companions. In an ant-hill the exchange or trade is conspicuous. The soldier defends the worker; the worker feeds the soldier. And now, having laid the foundations of our subject, we may venture to take a glance at the conduct of societies of featherless bipeds. The wars of the rival or competing States of mediæval Italy, were they anything more than exemplifications of the truth which the "extreme case" of the feathered biped has taught us,—the truth that "two of a trade can never agree"? And, on the other hand, as commerce has advanced, as occupations have been specialized, as exchange has extended over the world, has not war been increasingly subordinated to industry? Is not war disappearing, not before the advance of religion, but before the advance of mutual benefit resulting from mutual service—before the advance of *exchange?* Is not the age of war waning before the age of *commerce?* Did I err when I said that exchange is the foundation of society, the basis of peace?

But this exchange or trade, though it gives rise to invisible bonds, which unite men, as mutual servants, from end to end of the earth; this exchange or trade does not form *nations*. The nation is the result of predatory or defensive alliance—of *war*.

The squirrel-village, at which we glanced, is it not a fortification, —a stronghold? Wherein does it differ from the crannogs of the Scottish lochs, from the castle of Edinburgh or of any other ancient town, from the lake dwellings of Switzerland? Is not the motive of the squirrels in erecting a wall of earth between themselves and their enemies precisely the motive which induced Romulus to erect the earthen walls over which Remus leaped? Is it not the motive which built the stone walls of Jericho and Damascus and Babylon and Thebes and Troy, and the wooden walls to which the oracle commended the Athenians? And is it not the same motive which to-day erects iron walls to withstand the missiles of rifled cannon?

The flock, as we have seen, is the result of the search for the means of support,—the struggle for existence, in the narrow sense of

the term. The village is the result of war,—of the enemy,—of the struggle for existence in the broad sense of the term. As a necessary result of the struggle for existence—the struggle with the enemy—the village extends; it becomes the town, the city, the state, the nation. "Unite or die" is the foundation, not only of the union of the Thirteen Colonies, but of extended union the world over.

Unite or die,—this is the basis of the *nation*. I am not here speaking of the predatory nation,—*e.g.*, the Golden Horde, the Mahratta band, or Rome in the imperial days when she was the center of universal tribute; this corresponds to the flock, not to the village. I shall omit all reference to the ancient regime,—to an armed aristocracy, banded together for the purpose of extorting taxes from an unarmed peasantry. I shall have nothing to say about leadership, either human or divine, nor about worship, whether of the national hero or of the national god. Predatory politics, or the phenomena of predatory politics, do not here concern us. We have to do purely with the phenomena of the defensive aggregate.

Confining ourselves then to defensive politics, the salient fact which first confronts us is this: The essential of national existence is *strength*. The weak nation must succumb. I am aware that there are certain kid-gloved individuals who deny this,—who, deceived by outward politeness between nations, and never penetrating to the bottom of this or any other subject, dream of an age of peace,—an age of disarmament and arbitration,—an age wherein the lion and the lamb shall lie down together without the lamb being inside the lion. To these Sunday-school philosophers I have nothing to say. Demonstration would be wasted on them. But to those who have eyes to see, I would point out the plain fact that strength is the essential of existence. "In union is strength,"—here is the basis of the nation. "United we stand, divided we fall,"—here is the reason for continued union. And the warrant for declaring the United States an independent nation, entitled to take its place among the "powers" (mark the word) of the earth, was given by Henry in the simple statement, "Sir, we are *not* weak."

It follows that whatever tends to maintain or augment the strength of the nation is right; and, conversely, whatever tends to national weakness is wrong. And the first question concerning the propriety of dental legislation must be: Is its tendency (either direct or indirect) to strengthen or to weaken the nation?

This is the first question for discussion. And, curiously enough, this first question has never even been stated. Not a word of all the debate on dental legislation has had reference to the effect of this legislation, either immediate or remote, on the strength of the

nation. Not that nothing can be said on the subject. There is a vast deal could be said. The independent man (that is, the *strong* man) is the basis of the strong nation. Strong men are the result, not of governmental coddling, but of rugged self-reliance,—of looking out for themselves. Reliance on government, in antithesis to this *self*-reliance, tends to destroy the citizen's virility; it saps the foundations of the nation. Thus the great empires of the past were undermined; their strength was sapped; they fell. And, in the future, like consequences will follow like causes; history will repeat itself. On the other hand, the citizen's efficiency, and therefore the national strength, may be increased by protective measures on the part of government. Where is the happy medium, which, though it may weaken the individual, will result in greater associated strength, and increase the national efficiency?

It is not my purpose to discuss the subject of dental legislation, but merely to state the basis of rational discussion. Legislation (dental legislation) should tend to strengthen the nation. As the citizen is the basis of the nation, legislation should, if possible, tend to strengthen the citizen, both physically and intellectually. And, above all, it should tend to strengthen the citizen's individuality—his character.

On the other hand, legislation may tend to weaken the citizen, and yet may be correct. It may save to the citizen a great deal of labor, and may thus, like any other labor saving device, diminish his individual power, while increasing his social efficiency; may diminish the strength of the individual, yet augment the strength of the nation. The squirrel-legislation which establishes the sentinel to watch for the safety of the members of the village, is labor-saving. It saves to each one the labor of watching for himself. It may, by diminishing function, diminish individual strength. But the legislation is right, because the diminution in individual efficiency is more than counterbalanced by the gain in the community's efficiency.

Here, then, is the basis of rational discussion,—not "We want dental laws, and we want more laws, and we are going to have them;" but: Will dental laws and more laws conduce to our national efficiency?

So much for the *necessary* basis of dental laws. The "we want" —that is, we *dentists* want—must be eliminated, and the discussion must be based wholly on the ground of the national welfare in general and of the national strength in particular.

As to the spirit in which this discussion should be conducted, that is so evident that it need not be named. Plainly, it is the precise opposite of the narrow or partisan spirit which animates Dr. Brown.

I am not here saying that our present dental legislation is evil. I am not discussing the goodness or the badness of the existing laws. I am concerned only with the basis on which they should rest,—their proper moral and intellectual foundations. If I have correctly presented this basis, then (1), the *motive* of our legislation is bad—is unworthy of our profession; and (2), the rationality of that legislation has not been shown. Nevertheless, the legislation itself may be beneficial—by accident. Its moral basis is indefensible. Yet perhaps, as the desire of the Turks for plunder resulted in good to Germany and indeed to all Europe, as the selfish ambition of the Saxon Maurice advanced the cause of free thought and benefited mankind, so here a selfish motive may result in good to the nation. Its intellectual basis is—well, it is *wanting;* the reasoning whereby our laws are upheld is in startling contrast with that of Euclid. Yet perhaps, like the old woman who saved Rome by leaving her flock of geese in the meadow, the legislature may have accidentally done the country a service; it may, to use the polite expression, have "builded better than it knew." But even if our dental laws should prove, under criticism, to be scientifically correct, it remains palpably true that a people which is incapable of properly choosing its own dentists is, *a fortiori*, incapable of correctly choosing its own legislators; that the evils wrought by poor dentistry are as nothing compared with those wrought by the transmission of syphilis, either through contagion or through heredity; that pure science has a far higher claim to governmental recognition than any form of applied science; yet pure science receives no protection (for, while the relatively-poor nations of Europe have given public encouragement to a Descartes, a Galileo, a Columbus, a Newton, a Leibnitz, a Lagrange, a Laplace, a Macaulay, a Gibbon, a Davy, an Arago, a Lavoisier, a Hamilton, and to a multitude of other truth-seekers from Tycho Brahe to Koch, the richest country of the globe has done next to nothing for the advancement of discovery), and he who calmly considers these things is forced to conclude that the legislature has occupied itself with the "mint and anise and cummin" of legislation,—that there are "weightier matters," of which it might be said, "These ought ye to have done, and not to leave the other undone."

Perhaps the present article should terminate at this point. But, in order that discussion on dental legislation may be truly rational, a further datum is needed. We must seek and find—must know—the position occupied by the dentist in the body politic.

In our squirrel-village there is a watchman. The others *do*. He *sees*. He is "the man which goes round with his hands in his pockets

and don't do nothin'." He directs the movements of the others. He is to the members of the village precisely what the oracle was to the Athenians. He is the overseer, the supervisor, the director, the adviser.

On the hills to the west of San Francisco there are ground-squirrels, but there are no villages. Each squirrel lives alone,—has his hole, just as the settler in an Indian country has his stockade. He is surrounded by enemies; and, being alone, must antagonize them independently, on his own account. With him, there is no division of labor. He must both see and do for himself. The reason of his independent existence or solitary condition, is the poverty of the resources whereby he is supported. On the other side of the bay, among the rich wheat-fields, his confrères are congregated in villages,—each of which is, like ancient Rome, a walled town, surrounded by fertile land, of which each quadruped Roman crops his four jugera. Wealth results in union; and union results in increase of collective efficiency, by division of labor. And the first division which we find is that into the oracle and the inquirers—into seers and doers—advisers and people—professional men and laymen.

It is not, of course, that, in establishing seers, the doers lose all power of seeing; nor yet that the seers lose all power of doing. But, while every squirrel is both a seer and a doer, the seeing function is predominant in some, the doing function in others.

Pass now to communities of featherless bipeds. We have seen that difference (exchange) is the basis of alliance; wherefore we may expect to find, in every body politic, difference of function among the members. And as seeing and doing (science and art) are the two necessary functions of all living things, we may expect that the first great difference in the human body politic will be the same as that in the squirrel-village. Accordingly, we find everywhere the leaders and the led,—the head and the hands,—the seers and the doers. Neglecting that part of our subject which we have agreed to neglect,—aggressive war,—and confining ourselves to the internal phenomena of communities, we everywhere find the advisers and the advised, the men of brain and the men of brawn, the men of thought and the men of action, the men of science and the men of art. In every community, from the tribe of Red Indians to eternal Rome, the center of universal empire, we find two classes,—the priests or medicine-men, and the people.

It will not do to laugh at priests and priestly imposture as idle absurdities of the dark past. To the priest or medicine-man the world owes its emergence from the darkness of that past, owes a debt which it can never repay; owes, in fact, to the seer the sum-total of nineteenth-century civilization. It was the Chaldean as-

trologer-priest who taught us the rudiments of astronomy. It was the priestly caste of Egypt which gave us the alphabet, and established for us the basis of scientific medicine. And, away in the pre-historic past, by medicine-men who died and are forgotten, were laid the unseen foundations for the labors of Chaldean and Egyptian. To this day, our language bears the marks of the origin of science. We derive our "auspices" from the Roman augur; our "theories" from the Greek *θεωρία*.

The dentist, as he passes through Belgium, naturally stops to visit Gheel. He is interested in the rational or scientific treatment of insanity. He goes to the church; he makes his pilgrimage to the tomb of the patron saint of the insane. He stands by the shrine of St. Dymphna, the source, for centuries, of cures for minds diseased; for, in the darkness of the past, when the ghosts of the dead lingered at their tombs, that shrine possessed a healing power which, in the light of the scientific day, has vanished. He sees the grooves worn in the pavement by the knees of those who, in the dark days gone by, were brought thither for relief,—deep furrows which tell, more plainly than words, the pitiful story of human credulity. But he does not laugh at the priestly imposture. Looking back on the past, he sees devoted men, to whom came the parent bringing the child and the child bringing the parent. Mistaken these men certainly were. Like the medicine-men of our Red Indians, they often killed the patient instead of curing him. But, though widely in error at the outset, they were earnest seekers after truth; and they have found it. Leaving the shrine, the visitor passes through the town and goes on even to the cottages in the country round. Everywhere he finds patients. Everywhere the patients are well cared for. Nowhere is there a trace of that cruelty which still stains the unscientific treatment of mental disease. Where recovery is possible, it is rendered probable by rational care; and where recovery is impossible, friends are no longer tantalized with delusive hopes. Such is the ultimate outcome of the existence of a body of priests,—seers, students, men of learned leisure, men of science.

The division of the nation into two classes—priests and people, seers and doers—is universal. The primitive priests or medicine-men were certainly rude; but the primitive people were also rude, far ruder than their priests. And certainly, in the highly-developed nation, this primitive "segmentation" of the social ovum is indistinguishable among the many subsequent subdivisions which have taken place. In a community so highly specialized that some men spend their entire lives in sharpening pin-points, while others spend theirs in grooving the eyes of fine needles, the primitive division of labor may be difficult to find. But the division of the nation into

advisers and advised is universal; it is the salient fact of the primitive community, and it is equally plain in the highly-developed nation.

To which of these classes does the dentist belong,—to the head or to the hands? Of course he is not altogether the one or the other,—is neither all head nor all hands; for, as we have seen, the head and the hands are never wholly disunited: the seer is not entirely deprived of the doing faculty, nor is the doer wholly exempt from the function of seeing. The primitive priest was the seer of the community; yet he killed the sacrifice, dissected it, and burned the fat on the altar. Noting this, we may put our question in another form. Instead of, Is the dentist head or hands?—let us ask, Does the patient direct the dentist, or does the dentist direct the patient?—Is the dentist the advised, or is he the adviser? When the question is thus put, the answer is plain. The dentist belongs to the head—the brains—of the community. People consult him. When Dr. Clowes and Dr. Davenport discuss the advisability of removing the first molar, they are *thinking for their patients.*

The dentist, then, is a "doctor,"—that is, a *teacher.* "Διδάσκαλε, τί ἀγαθὸν ποιήσω"—Doctor, what good thing shall I do?—this is the universal query; to answer this question is the first and greatest duty of the professional man. It is the first and greatest duty of the dentist.

As there has been division of labor among the people, so there has been division of labor among the medicine-men. The primitive priest—doctor, seer—has had his functions subdivided and committed to several distinct professions. Yet all are seers. And, throughout the subdivisions of the seeing or student force of the community, one thing is everywhere found. There is one uniform feature everywhere characterizing the true professional man. That one thing, characteristic of the seer, is public spirit—*unselfishness.*

Everywhere, the seer is a *teacher*—a doctor. He may or may not be a doctor according to the canons of institutionized mediocrity. But whether he be or be not a teacher in name, he is a teacher in fact. He is a guide. And the essential of the guide is not merely that he should see, but that he should see for *others.* The squirrel-sentinel is on the alert, not for himself, but for his wards. The Paul seeks "not his own, but others' good." The Socrates, the Plato, the Epicurus, the Bruno, the Savonarola, the Latimer, the Galileo, the Harvey, the Paine, the Jenner, the Franklin—all have sought the welfare of their respective nations and of mankind. The physician certainly desires his fee; but he desires still more the welfare of his patient. And the dentist? Every one has heard some layman remark that dentists subsidize candy factories, in

order to make business. And every one knows that the course of the dentists is precisely the opposite of that thus predicted,—that they constantly advise their patients for the patients' good and against their own interest; while every number of the DENTAL COSMOS contains the plainest evidence that they are endeavoring to establish a system of prophylaxis for which they are to receive no pay, in place of the present system of cure for which they are paid. They fulfill to the utmost the desire of Bacon concerning professional men,—"that they do not devote themselves wholly to the getting of money, but do generously employ their talents for the welfare of mankind."

Says Dr. Black, "We"—that is, we dentists—"are professional men." As professional men, our first duty is study. This is a duty which we, as professional men, are pledged to perform. And this study is to be carried out, not merely for our own good, but in the interest of humanity.

Such is the position of the dentist. He is a seer. He belongs to the head of the community. The true dentist is an adviser or guide, devoting himself to the welfare of others.

The question of dental legislation, then, is part of a wider question: How far should the people have liberty to choose their own guides; and how far should their liberty be restrained? It is evident that a truly self-governing people would need no restriction on its liberty,—would, in fact, suffer from such restriction. And, on the other hand, it is evident that a people absolutely incapable of self-government would need absolute restriction,—could not be given any liberty. The imbecile must necessarily be despotically ruled. The horse is incapable of choosing his dentist; horse-dentistry, or ass-dentistry, must be compulsory. The need for dental legislation will therefore vary as the people vary.

The first question concerning dental legislation must then be, What is the present ability of the people to choose their own advisers?

The second question must be, What will be the general effect of the proposed restriction of liberty? Will it result in the citizen's elevation or in his degradation? Will it conduce to national strength, or will it tend to national weakness?

Here, in the barest outline, is the basis for a rational discussion of dental legislation. To fill up this outline would require a volume—a *large* volume. Wherefore details cannot, in this place, be entered on. Moreover, to do more than indicate the basis of rational discussion would be, at present, to waste labor. For, now, a wave of dental legislation is sweeping over the land. At first glance it might seem that the period of a wave of legislation would be just the time

for a discussion of its propriety. But consideration will show that it is not so. The time of action is not the time of reason. When Peter the Hermit was raving about the rescue of the Holy Sepulchre, and the wave was spreading over Europe, could a rational discussion of the merits of crusading have obtained a hearing? When a circle of dervishes is pirouetting for the amusement of the Almighty, will attention be paid to any one who suggests the possibility that the Creator of heaven and earth may not be greatly pleased by the show? And so with waves in general,—with the dancing mania of the middle ages; with the craze of the sixteenth century for ruffs and farthingales and the modern craze for tight-lacing, etc.; with the present panic in San Francisco concerning the most preventible of diseases. These matters are beyond the reach of reason. Protests may be entered; but, until the tumult subsides, the calm voice of reason cannot be heard. And is it otherwise with the subject of dental legislation at the present time,—when Dr. Brown, refusing argument, replies to Dr. Shumway in this high-handed fashion: "When he talks against dental laws, he is talking right against common sense; we want more laws, and we are going to have them"?

My purpose, then, is not to exhaust the subject,—not to present in full the scientific basis of the art of dental legislation;—still less to discuss the application of this scientific truth. My object is merely to enter a protest; and this protest, though it will be met as Dr. Shumway was met, will not be without its use. Certainly, it will not be immediately heeded. It will be neglected by some, reviled by others, misunderstood by most. The *vox clamantis in deserto* is always an object of ridicule to the thoughtless and the shallow. But it sows the seed,—which, though at first it falls to the ground and is buried in obscurity, will spring up, and bear fruit after many days.

A METHOD OF COMBINING AMALGAM AND GOLD, SECURING A FIRM UNION BETWEEN THE TWO, AND COMPLETING THE FILLING AT ONE SITTING.

BY DWIGHT M. CLAPP, D.M.D., BOSTON, MASS.

(Read before the New York Odontological Society, October 9, 1888.)

I LOOK upon dentistry as a means to be employed for preserving teeth and rendering them useful for the longest time possible, and not as an opportunity for exhibiting the artistic and mechanical skill of the dentist, regardless of the patient's appearance and comfort.

It is, and always has been, a difficult task for me to save teeth, and I hail with delight any hint or suggestion, from whatever source, that assists me in any way to make my efforts more successful.

From this and kindred societies I have received much. Your papers and discussions have been like sign-boards with the friendly hand pointing the way. If I am able to bring you anything in return, and thereby discharge a fraction of my indebtedness, it will be to me much gratification.

The combination of amalgam and gold in one filling is not suitable for every cavity. Like everything else, it must be used with proper reference to its qualities and characteristics. It is in the large approximal cavities in the posterior teeth—to the filling of which with either gold or amalgam there are many objections—that this combination is destined, I trust, to be of great benefit.

Some of the objectionable qualities of amalgam in such cases are its color, its inclination to change shape, and its brittleness, noted particularly at the edges of fillings extending onto the grinding-surfaces of teeth. Some of its good qualities are: the ease with which it can be packed into irregular and out-of-the-way cavities, its hardness, the short time it takes to make large fillings of it, and its power to prevent further decay.

Some of the disadvantages of gold are: the difficulty of packing it perfectly in places not easy of access. The preparation of gold that can be made solid in a cavity of a tooth quickly and with but little pressure has not yet been produced; and no mallet, be it automatic, pneumatic, electric, mechanical, or hand, will hit successfully around a corner; consequently, to use gold, in many cases, much of the tooth must be sacrificed in order to shape the cavity properly for it; this also involves time, pain, and much discomfort for the patient.

After the cavity is prepared, if large and at the back part of the mouth, very much time must be consumed in packing the gold, and the patient, to say nothing of the operator, suffers great exhaustion. Indeed, I marvel at the courage under these circumstances exhibited by many patients, and we have no right to impose on them simply because they have confidence in us and are willing to endure whatever we say is best. These are some of the disadvantages we must set up against gold as a material for filling teeth. It has, however, its good qualities. We feel it to be pure and wholesome; its color is less objectionable than that of amalgam; it is malleable, possessing the greatest edge-strength of any filling-material; it is strong and lasting.

Here we have, then, the two materials, amalgam and gold, each possessing desirable and undesirable qualities for fillings under certain circumstances. If, therefore, we can combine the two in a manner to make use of the *good* qualities of each and to get rid of their imperfections, shall we not lessen the difficulty and increase the possibility of saving teeth? To be practical, let us take the case

of an inferior second molar. The decay involves the larger portion of its distal surface, extending below the gum and well around on the lingual side; it also involves a portion of the grinding-surface. Decay has not reached the pulp, but is dangerously near it. The tooth inclines a little backward, the third molar is in place. This case will be found, most likely, in a small mouth, with lip and cheek-muscles rigid and unyielding, like bands of raw-hide. To me a cavity like this presents great difficulties. To fill it with gold it must be so shaped that every portion may be reached direct. To pack the gold as it should be, particularly if a contour filling,—and it should almost never be anything else,—will be a long, tedious operation, and the entire work should have at least two, and better three sittings, for its completion. When done, you have what? a large mass of gold, put in place with much labor, pain, and exhaustion, and which, it is almost certain, will be "patched" with amalgam in three or four years. Why not put the patch in to start with?

Why not make the whole filling of amalgam? it may be asked. In the first place a fastidious person objects to its color, and in the second place the portion of the filling extending onto the grinding-surface must almost invariably have some portion of its edges thin, and the thin places will become broken in eating, leaving the borders of the filling ragged and the adjoining enamel of the tooth unsupported. As a consequence, the edges of both tooth and filling will become to a certain extent broken away, the joint between the two becomes imperfect, and decay follows.

If we were to examine two fillings, one of amalgam and the other of gold that had been in cavities like the one described for five years or more, should we not rather expect to find the one of gold defective near the gum, and the one of amalgam on the grinding-surface? Therefore, bearing in mind the advantages and defects of each of these materials, why shall we not use each in the place to which it is the best adapted, provided we can bring about a satisfactory union between them? Believing that this union can be obtained, and thereby the good qualities of each secured, I am glad of this opportunity to advocate the more general use of this combination. Who it was that first suggested using these materials together I do not know, neither do I care. Whoever he was, he has my sincere gratitude. The first mention of it that I remember was by Dr. Kingsley, of this city, about 1872; and Prof. D. D. Smith, of Philadelphia, read a paper on the subject some years ago before the Massachusetts Dental Society. For the last ten or fifteen years I have occasionally tried to make this combination, but with indifferent success. It is only within the last year or so that I have made satisfactory fillings.

Let me pause here for a moment to say that I make no claim of originality for a single fact or statement set forth. If, when I am done, you shall say, "I knew all this before, and did just the same thing when I was a boy," I shall reply, "Very likely you did."

I have not tried to work along the line of original investigation. We pass the magnet through a mass of material to collect the particles of steel and iron therein. So I have tried to collect the steel and iron—the hard facts—from the mass of knowledge always surrounding us, and to bring them together around this subject, and if possible to make a better filling than has ever been made before within its proper sphere.

To make a good combination filling of amalgam and gold, it is necessary to have in mind that it requires just as much care from start to finish as an entire gold filling. If you wish to do slouchy and indifferent work, you cannot do it better than by throwing gold and amalgam at a tooth. If you wish to succeed, it must be at the price of eternal vigilance. This kind of work will repay all the neatness, delicacy, and attention that can be given it.

The cavity should be carefully prepared, having that portion of the walls to be occupied by the amalgam as square as possible, so as to leave no thin portion of the filling to be easily broken; it must be shaped so as to retain the filling, which will be one solid mass, and more easily retained than if liable to crumble to pieces. The cavity being ready, the next step is to adjust a matrix so as to hold the amalgam absolutely in place until the filling is completed. I wish to ask your careful attention to this, for, if not thoroughly understood, a failure will be the probable result. As soon as gold is added to fresh amalgam, it at once absorbs enough of the mercury to leave the filling exceedingly brittle, and this brittle mass must be so held in place as to withstand all the force necessary for thoroughly condensing the gold; therefore a suitable matrix, and that securely adjusted, is an absolute necessity. There is one that I have found particularly useful, which I will describe. Any metal not acted on by mercury may be used. I like German silver, because it is cheap, pliable, and tough. A piece the thickness of heavy writing-paper, and long enough to extend perhaps a third around the tooth, and wide enough to reach from just beyond the cervical border of the cavity to a little beyond the grinding-surface of the tooth, is required. One side is rounded a little, so as not to hurt the gum; two holes are punched in the rounded edge, far enough apart to span the cavity; waxed floss silk is then threaded into one hole and out the other. After the rubber-dam is adjusted, the matrix is carried into place with the ligature on which it is strung. The silk is then wound round and round the tooth and matrix until that portion of the

metal against which the filling is to come is completely covered: this gives sufficient strength to resist the pressure of packing the filling. It is best to draw the first two or three turns of the silk very tightly and then tie: this is to keep the matrix securely against the cervical border of the cavity. If the filling is to have much contour, the remaining turns of the ligature may be a little less firmly drawn, so that with an oval burnisher the matrix may be formed out from the inside of the cavity to the shape required for the filling. It sometimes happens that the crown of the tooth is smaller at the grinding end than at the gum, rendering the silk liable to slip off. In this case, an application of copal ether varnish, either before or after the ligature is adjusted, will usually remedy the difficulty. The corners of the matrix left uncovered by the silk should be bent over onto it as an additional safeguard against slipping. This matrix, a modification of the ideas of several eminent men, can be used oftener, I think, than any other.

We are now ready for the filling. The amalgam should be mixed the same as for a crown filling, dry—but not so dry as to prevent a proper adjustment to the walls of the cavity. It should be put in with sufficient pressure to make it solid and dense; if mercury is brought to the surface, it should be removed before adding the gold. When the cavity is sufficiently full of amalgam, small pieces of Steurer's plastic gold are immediately added, using medium-sized points for condensing. I often use the same as for packing the amalgam. The first few pieces of the gold will disappear entirely,—that is, they will become so saturated with the mercury as to lose the appearance of gold, but, by persevering, the gold will soon assert itself and overpower the mercury. After the surface has been entirely covered with the Steurer's plastic gold, the filling can be completed with the same or any other cohesive gold, with hand or mallet pressure.

The filling can be finished immediately with stones, sand-paper disks and strips, in the usual way, without fear of the gold being covered with mercury *provided the work has been carefully and neatly done*. If particles of the amalgam were allowed to remain clinging to the matrix or lodged in the folds of the rubber, they will now most likely give trouble by being caught up by the disk or strip and rubbed over the gold, and as these little pieces of amalgam have not become as hard as that which was in contact with the gold during the process of filling, they will coat the gold with mercury, thereby spoiling the looks of the filling. I cannot, therefore, repeat too often or emphasize too strongly the fact that this work must be neatly and cleverly done to insure the degree of perfection possible to be attained. Care should be taken in finishing, and the patient cautioned not to use it too roughly for a little time, for it may be

possible at this stage to break the filling open, as not sufficient time has elapsed for the complete hardening of the amalgam.

I have usually been in the habit of having some undercuts for the retention of the gold, and not to depend entirely on its union with the amalgam, but I am becoming more and more convinced that this is unnecessary, and that the union between the two is all that is required.*

All of my experiments have been conducted in the face of long and deep-seated prejudice, and with a feeling that free mercury could not be used in connection with gold without destroying the integrity of the latter.

Nearly five-and-twenty years ago, the dentist with whom I then was tried to impress me with the absolute necessity of keeping mercury away from the gold used in plate work, and to illustrate his teaching took a scrap of gold and put on it a small amount of mercury. Almost instantly the gold became as soft and rotten as a piece of wet paper. Nothing but the facts brought about by my experiments have led me to adopt this combination.

Many of us have been reluctant to use amalgam where decay has taken place at the cervical border of large gold fillings, yet we have done so, and have been surprised years later to note not only the good condition of the filling thus treated, but also of the tooth surrounding it. In other words, the teeth seem to tolerate this filling, and experience shows that decay is less likely to continue after a filling of this kind than after one of gold or amalgam, when used separately. Another point that is noticed in connection with this combination is that thermal and galvanic shocks are much less likely to follow its use than when the filling is made of one material.

Still another point is the ease with which contour fillings are made, and the hardness prevents the wearing away the small points of contact, thus preserving the contour for a long time. This, in brief, is the way and some of the reasons why I combine amalgam and gold in large cavities in the posterior teeth. In cases where it is indicated, I do not know of any filling that compares with it for adaptation, ease of manipulation, contour, and durability.

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* Since reading this paper, Dr. Clapp has received a letter from Dr. Perkins, of Vermont, from which the following extract is taken:

"You may remember having inserted a large amalgo-gold filling in one of my lower molars last March. You filled about two-thirds of the cavity with amalgam, and immediately completed the filling with gold. There was no anchorage left in the cavity for holding the gold; its retention depended upon its union with the amalgam.

"I have tested it by seven months of mastication; I have tried it with instruments. With a strong excavator I have pulled on the gold about as hard as I could with one hand, trying to separate it from the amalgam. It does not separate; it is there to stay."

ETIOLOGY OF IRREGULARITIES OF THE JAWS AND TEETH.*

BY EUGENE S. TALBOT, M.D., D.D.S., CHICAGO, ILL.

VI.

The Alveolar Process.

(Read before the Chicago Dental Club, November 26, 1888.)

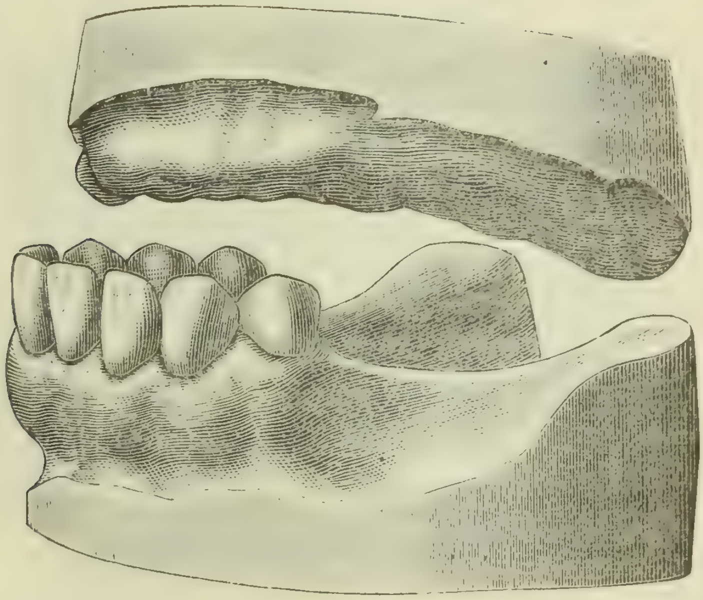
The alveolar processes are situated upon the superior border of the inferior maxilla and upon the inferior border of the superior maxilla. These bones are considered a part of the maxillary bones, and are so described by anatomists. They should, however, be considered and described as practically separate and distinct bones. Their structure and functions differ so completely from the structure and functions of the maxillary bones that there is little or no similarity between them. The superior and inferior maxillæ are (unlike the alveolar processes) composed of hard, compact bone-structure. The large, powerful muscles attached to them would indicate that powerful work is to be accomplished, and when fully developed they retain their full size through life. The alveolar processes are composed of soft and spongy bone of a relatively cancellous structure. The inferior alveolar process includes that part of the inferior maxilla situated between one and two lines above the mental foramen, and extends as far back as the external oblique line. The superior alveolar process includes that part of the superior maxilla lying from one or two lines below the hard palate extending as far back as, and including, the maxillary tuberosity. As early as the eleventh week of intra-uterine life, calcification of the deciduous teeth commences, and by the twentieth week calcific material is quite abundantly deposited. Ossification is also rapidly progressing about the dental follicles. At birth the sacs are nearly or quite enclosed in their soft bony crypts, and the crowns of the teeth upon their outer surface are composed of enamel, which is dense and hard.

The alveolar process, being soft and spongy, molds itself about the sacs containing the crowns of the teeth and about their roots after their eruption, regardless of their positions in the jaw. While the alveolar processes have grown rapidly, they have up to this time developed only sufficiently to cover and protect the follicles while calcification proceeds. When the crowns have become calcified and the roots have begun to take in their calcific material, absorption of the borders of the processes takes place in the order of the eruption of the teeth. When the teeth have erupted, the alveolar process develops with the teeth until they attain the depth of

the roots of the teeth. The crypts of the permanent teeth are located at the apices of the roots of the temporary teeth. These teeth have large crowns which approximate each other from the median line to the posterior part of the jaw. These teeth, as they erupt, entirely absorb the alveolar process which surrounded the temporary teeth, and, as the new set come into place, a new process is built up about them for their support. The permanent teeth require a deeper alveolar process to support their roots, which are much longer than those of the temporary teeth. Hence the difference in the depth of the arches of the first and second sets of teeth.

After the removal of the permanent teeth the alveolar process is entirely absorbed. Fig. 1 shows how absorption takes place. The teeth have all been removed from the superior maxilla, as has also

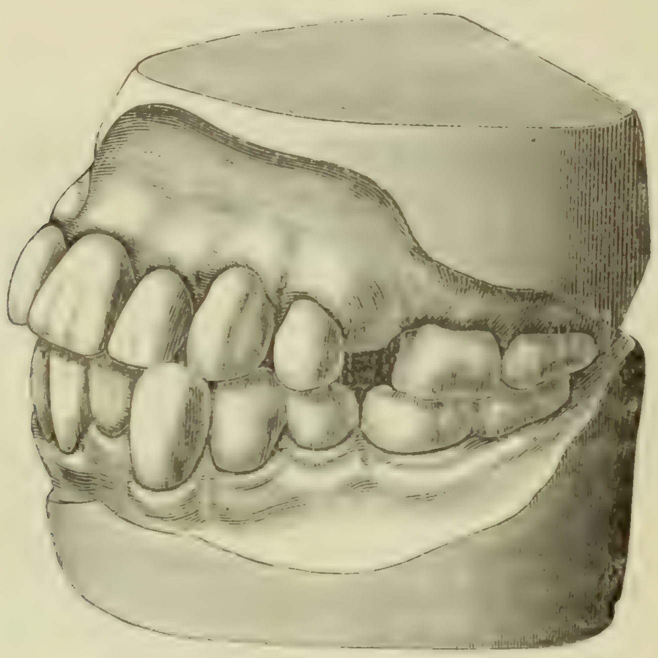
Fig. 1.



the alveolar process. The molars on the lower jaw have been extracted and absorption of the alveolar process has resulted, showing a marked contrast in connection with the anterior alveolar process, which remains intact and holds the teeth firmly in place. Thus it will be observed from the changes which occur from the first development of the teeth to their final extraction, that the alveolar process is solely for the purpose of protecting the teeth in their crypts during their development and after their eruption. When the temporary teeth are in place the alveolar process remains unchanged until about the sixth year, when the second set of teeth appears. The crowns of the permanent teeth require more space than those of the temporary set; and the alveolar process must necessarily enlarge to accommodate them. This enlargement of the alveolar process is doubtless caused by the formation of the crowns of the permanent teeth before eruption and to a limited extent by the growth

of the maxillary bones, which may cease developing at any period in the life of the individual, or continue as late as the thirty-sixth year. The diameter of the crowns of the permanent teeth forming a larger circle than that of the maxillary bones, the alveolar process must necessarily increase its diameter. It is often forced outside of the superior maxilla by the crowns of the permanent teeth crowding and wedging themselves into positions anterior to the first permanent molar teeth. This enlargement of the alveolar process usually takes place anterior to the first permanent molars. We expect to find the process corresponding in size to the jaws. Fig. 2 shows a comparatively small superior maxilla, the inferior being much larger. This is the result of arrested development. To allow

Fig. 2.



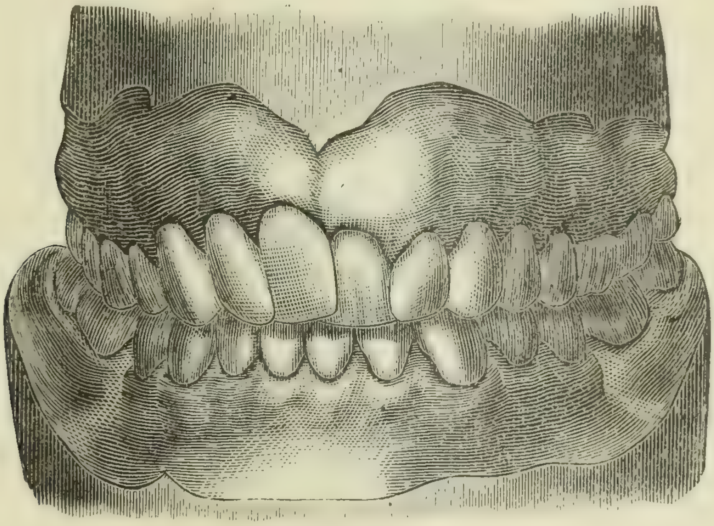
for the deficiency in bone-structure and allow the upper teeth to extend over the lower, the upper teeth have forced the alveolar process forward. The space shows where a tooth was extracted after all the teeth were in position.

Fig. 1 shows a similar case where all the upper teeth have been removed and absorption has entirely obliterated the alveolar process. The relations of the superior maxillary bones to the alveolar process and teeth on the lower jaw are well illustrated. When the alveolar process and teeth were intact they presented an appearance like illustration No. 2.

The position and shape of the processes and their relation to each other are governed entirely by the location and size of the teeth and roots, and not by the shape of the jaw-bone proper. The dental follicles containing the crowns may be located upon the outer border of the jaw-bone on one side, in which case the alveolar process will be

situated upon the outer border and assume an irregular arch. If the crowns of the teeth are located upon the inner border, or if one jaw be smaller than the other, the teeth will articulate and the process will form a smaller circle than the jaw-bone proper. Such a case is illustrated in Fig. 3. The superior maxilla is much larger than the inferior, and, as a result, the articulation of the teeth and the muscles of the cheeks and lips have carried the teeth and alveolar process on the upper jaw inward. The teeth on the lower jaw are regular and appear to have sufficient room, while those upon the upper jaw are crowded and overlap each other. The teeth on the left side of the upper jaw are more regular than those on the right side. Upon examining the mouth or model, the arch on the left side will be found full and regular, while the arch upon the right side forms a perfect semi V shape.

FIG. 3.



The alveolar process on the right side extends considerably over the border of the maxillary bone, and the teeth (especially the cuspid) have taken quite an incline in order to articulate with the teeth upon the lower jaw, thus crowding the alveolar process to the inner border of the maxillary bones.

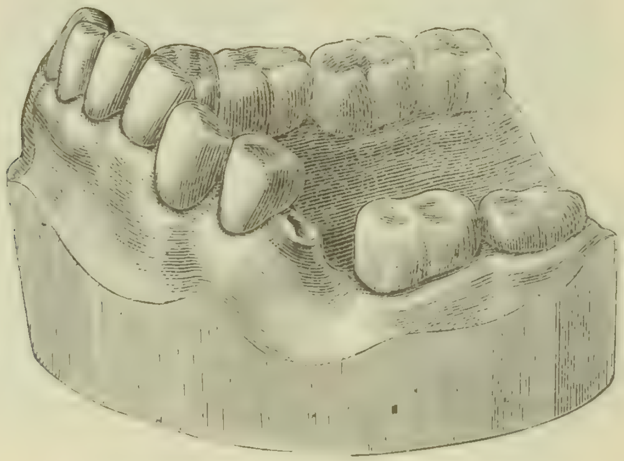
The process is solely for retaining the teeth, and if for any reason the dental follicles should not be present and the tooth should not erupt, or if it should have been extracted early, the process would not be developed at that point. In my collection of models may be seen cases of arrested development of the alveolar process, caused by the lack of bicuspid and lateral incisor germs, and by the extraction of the deciduous and permanent teeth.

If one or more teeth should not antagonize, the alveolar process would extend beyond the natural border, carrying the teeth with it. A marked illustration of this is seen where the molars are decayed to the gum and the roots remain. The vascularity of the process is

such that its development results. Excessive development of the alveolar process is frequently observed by every practitioner in connection with the anterior inferior teeth. When the articulation is normal, occlusion of these teeth never takes place. We frequently find (especially in patients from ten to sixteen years of age) these teeth extending to and occluding with the mucous membrane of the hard palate, making one of the most difficult forms of irregularities to correct. Such a case is illustrated in Fig. 4. This model is taken from the jaw of a person thirty-seven years of age, but I venture the statement that this excessive development took place between the ages of ten and sixteen, because at that period the vascularity of the tissues is more vigorous and the development of the process more formative than at any period subsequent to the development of the first permanent teeth.

I recall a case in practice in which the incisors and cuspids,

Fig. 4.



together with their alveolar process, are situated upon the external surface, while the bicuspids, molars, and their alveolar process are located upon the inner border of the jaw. Another case is one in which the alveolar process failed to cover the roots of the bicuspids and molars upon the outer surface, the teeth having forced themselves into a larger circle through the alveolar process by the contact of the crowns. The roots in this case can be easily outlined by the finger through the mucous membrane, the outer plate of the alveolar process barely, if at all, covering them. Mr. Tomes mentions and illustrates a case in a late work of faulty development of the outer plate of the alveolar process exposing the crowns of all the temporary teeth. The case was a child who had suffered from hydrocephalus. I have a number of models showing the anterior alveolar process projecting beyond the normal position by the forward movement of the molars. This may be due to a natural movement of the molars forward, or the process may be forced

forward by the improper occlusion of the jaws. The teeth are moved from one position to another simply by the force consequent upon absorption and deposition of bone. This is noticeable in the spaces between the centrals, when the alveolar process develops to a larger circle than is necessary to accommodate the teeth. The alveolar processes are influenced in one direction or the other by the pressure of articulation. This abnormal condition is the result of inharmonious development of the jaws. The teeth may come together in such a manner as to throw the alveolar processes either to the right or left, thus producing a full round arch upon one side of the jaws and a perfectly flat or straight arch upon the other. (See Fig. 3.) The greatest deformity is that in which the teeth of the upper jaw and alveolar process are forced forward, causing a protrusion of the anterior superior part of the mouth. Occasionally we find both upper and lower alveolar processes carried forward in the same manner. The alveolar process upon the lower jaw is more liable to be found upon the inner border of the jaw than is the upper alveolar process, as the inferior maxilla is larger and more dense than the superior, and when the teeth are once in position upon the lower jaw they are not liable to subsequent change. Owing to this fact the teeth of the superior maxilla do not form so great a circle, causing the teeth upon the sides of the jaws to conflict and the lower teeth and alveolar processes to be carried in, while the anterior teeth of the lower jaw are held inside of the superior anterior teeth, thus carrying the alveolar process inward.

The teeth are continually changing their positions in the mouth. This is beneficial as often as it is detrimental. That the teeth may perform their full function, they should not only remain firmly fixed in the alveolar process, but they should also antagonize. The teeth may be compared to the bricks in an arch. Remove a brick and the arch falls to pieces. It is frequently found that the teeth do not articulate properly, and by cutting away the approximal surfaces a better articulation may be secured. When this operation is performed, the teeth move in their sockets by absorption and deposition of bone, demonstrating the fact that the process changes in shape and substance.

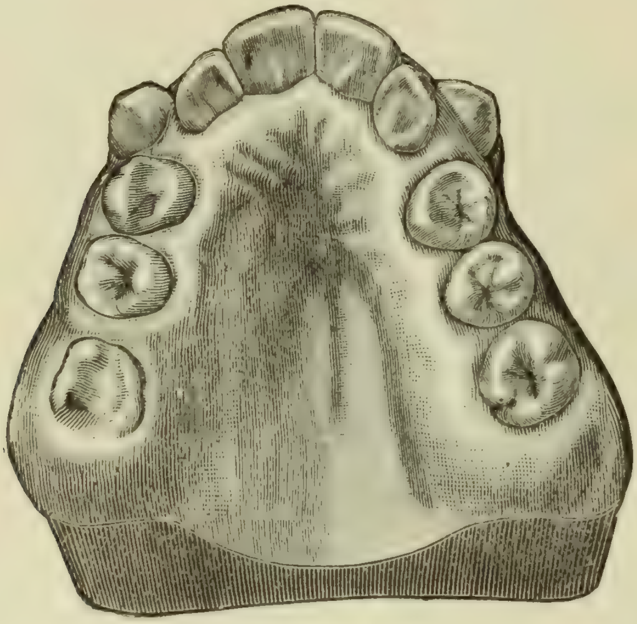
Hypertrophy of the Alveolar Process.

From what has already been said of the vascularity of the alveolar process, we may expect to find hypertrophy of the tissue ensuing from simple irritation of varying degree.

The irritation consequent upon the eruption of the teeth, together with the excessive blood-supply, are both primal causes of over-building of tissue, *i.e.*, hyperplasia.

The ragged roots of the temporary teeth, produced by absorption, the gases from the putrescent pulps, and the pressure of the permanent crowns against the tissues, produce sufficient stimulation to excite physiological action. Tissue-building generally is seen in connection with the teeth posterior to the cuspid, rather than with the teeth anterior to that tooth. It seems accountable only from the fact that the incisors have sharp cutting-edges, the roots of the teeth are single and nearly always shed before the permanent teeth are in place, and they erupt at an age when there is less vitality. Per contra, the crowns of the teeth posterior to the cuspid are broad, the roots of the temporary teeth posterior to the cuspids are more numerous than those anterior to them, and, with the exception of the first permanent molars, they erupt at the age of greatest vitality. The process becomes unnaturally thick, the bicuspids and

Fig. 5.

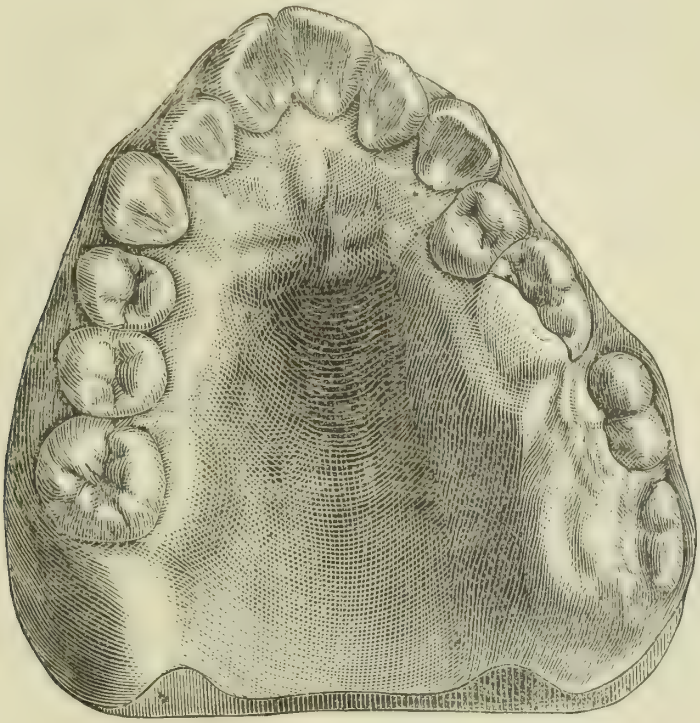


molars are carried in one direction and another, effecting a variety of irregularities. A common form is shown in Fig. 5. Similar irregularities are also seen in Coles's "Deformities of the Mouth," Figs. 12, 13, and 27; and in Tomes's "Dental Surgery," Fig. 90. These deformities all take the contour of the saddle-shaped arch. This may be accounted for from the fact that the permanent molars being the first teeth to erupt they become fixed before the deposit commences. When these teeth do not antagonize, they are liable to be carried inward.

The cuspids with their long roots meet resistance either in connection with the teeth adjoining or with those upon the opposite jaw, and are thus held in position. It will be observed that, in all of these cases, the enlargement seems to be associated with the inner plate of the alveolar process. My observation in these cases has been that

with most of them the inner plate is the part of the alveolar process affected. The outer plate, although quite irregular from the arrangement of the teeth, is usually normal in thickness. This disparity in the two plates of the alveolar process may be accounted for from the fact that the inner plate of the alveolar process possesses a large blood-supply, the posterior or descending palatine arteries furnishing the ossific material. Occasionally, hypertrophy will affect one side only or one distinct locality. Fig. 6 illustrates such a case. In

Fig. 6.



this case the enlargement is upon the left side and extends from the first bicuspid posterior to, and including, the maxillary tuberosity. Instead of the force being directed inward, as is generally the case, the process is forced outward and backward. This enlargement occurred previous to the development of the second and third molars. The alveolar process extends downward and occludes with the teeth upon the lower jaw, thus preventing the molars from erupting.

REMOVABLE PLATE BRIDGES.*

BY DR. GEORGE EVANS, NEW YORK, N. Y.

In this style of bridge a plate is used to span the space and support the artificial teeth between the abutments. A prime requisite

* By permission of the author we transfer to the pages of the Dental Cosmos so much of the chapter on "Removable Bridge-Work" in Dr. Evans's recent volume, "A Practical Treatise on Artificial Crown- and Bridge-Work," as will answer many inquiries from our readers for a practical method of constructing removable dentures.

of removable plate bridges is that the posts and collars or any form of attachments used shall move evenly on and off the supporting roots or crowns in their adjustment and removal. To secure this, the post-cavities and crowns should be shaped and the gold crowns formed so that the lines of the centers of the cavities and of the sides of the gold crowns shall be as nearly as possible parallel. To facilitate the operation, posts of wood or metal should be first accurately but loosely inserted in the root-canals, protruding a quarter of an inch, and an impression taken. On the model made from this impression the posts will be found in position as in the mouth. The plaster crowns are then trimmed to the required form. Gutta-percha or impression compound, fitted to the model and removed with the posts in position in it, can then be used to guide the operator, and gauge the preparation of teeth or roots in the mouth.

Fig. 1.

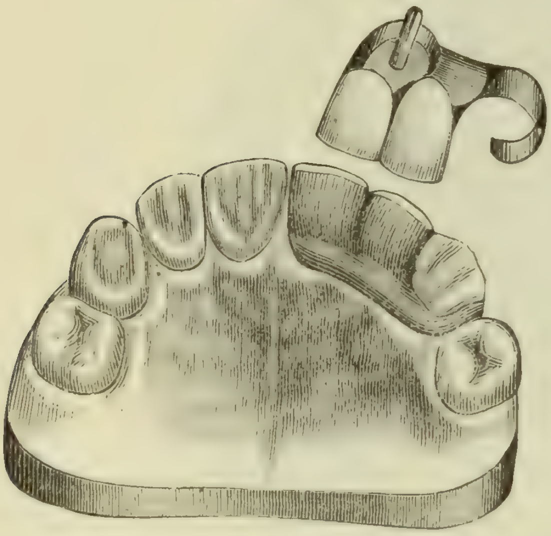
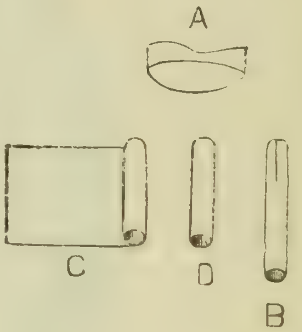


Fig. 2.



The case shown in Fig. 1 will be taken to describe the constructive details of this class of dentures. In the root of the central a tube is inserted, attached to a cap on the end of the root. Over this cap is placed an outer cap which has a split spring pivot or post fitting the tube. A narrow plate between the teeth connects the outer cap to a clasp which fits around and rests upon the cuspid.

The process of construction is as follows,—the method being similar when applied to larger dentures of this class: The root of the central is first prepared and capped the same as for a collar crown. The cap is best formed of iridio-platinum plate, No. 35, U. S. standard gauge (A, Fig. 2). A substantial piece of gold and platinum wire, from No. 16 to No. 18 U. S. standard gauge (the number being regulated by the size of the root), is slit about one-eighth of an inch so as to form a spring-post or pivot. This is easily done by placing the wire in a vise and steadily cutting it downward through the

center with a saw-edged strip of very thin steel (Fig. 3). This takes only a few minutes, and is preferable to partially joining two pieces of half-round wire.

The wire is then tapped together at the slit, burnished smooth and rounded just at the end (B, Fig. 2). The tube for this pivot is formed by once wrapping the pivot with a piece of iridio-platinum plate, No. 32 U. S. standard gauge, the edges of which are beveled and cut to meet even and close (C). The pivot is then withdrawn, and the seam is touched along its length with the smallest possible quantity of borax. The proper manner to use borax in fine work is to grind it, mixed with water, on a slab to a cream-like consistence, and apply on the point of a camel's-hair brush. A very small piece of pure gold is placed in the seam, and the tube is held in the flame of an alcohol lamp. When a sufficient degree of heat is reached, the gold will flow along the seam and form a joint without obstructing the inside passage for the pivot. The pivot is then

FIG. 3.

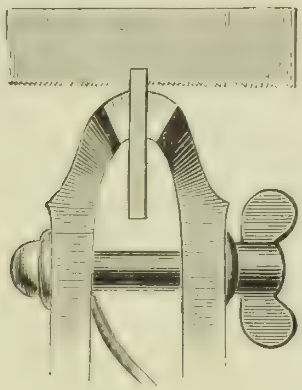
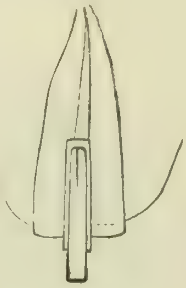


FIG. 4.



inserted, and the tube trimmed (D) and gauged in a gauge-plate. With a drill just the size of the tube the root-canal is enlarged so that the tube will fit in tightly. This plan prevents weakening of the root by too great enlargement of the canal. A hole the size of the tube is made through the cap, and they are then adjusted (Fig. 4), and the pivot being withdrawn, the cap and tube are removed, invested, and soldered (A, Fig. 5). The cuspid, which because of its conical formation is one of the most difficult teeth in the mouth to clasp, is trimmed sufficiently to partially square its approximal sides, and the palatal portion is notched slightly (A, Fig. 6), to form a shoulder for the clasp to rest upon. This notch can be safely made, as the enamel is very dense at the point indicated.

A gold plate is swaged to fill the space between the central root and the cuspid as shown in Fig. 5. The cap and pivot are adjusted on the central root and the plate is then fitted in the mouth, pressed tightly in position against the gum, and retained there with a little

wax which is cemented to the plate and pressed against the cuspid and side of the cap. An impression of the parts and an articulation are then taken in plaster. The cap, pivot, and plate being removed in the impression, they will be presented on the model made from it in exactly the same position as in the mouth. A second or outer cap is then constructed for the root-cap, the band being made very narrow at the approximal and palatal side, and open at the labial side, as the porcelain tooth to be attached will serve in its stead (B). The pin is then soldered fast in the outer cap, and a clasp of gold (C), No. 23 to No. 24 U. S. standard gauge, is formed to extend well around the posterior approximal portion of the cuspid. The outer cap having been placed in position on the inner one, the plate extending from the central to the cuspid is cemented to it and to the clasp with wax, removed, invested, and the parts soldered together. Aided by the plaster articulation, teeth are ground and fitted by the

Fig. 5.

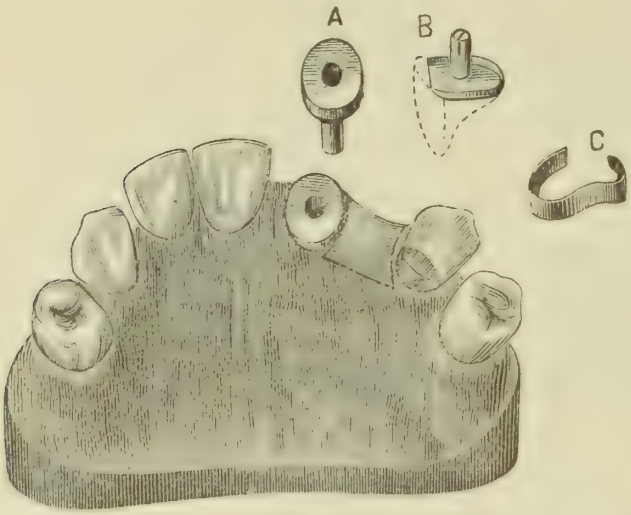
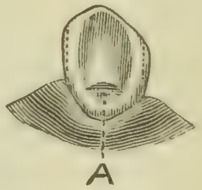


Fig. 6.

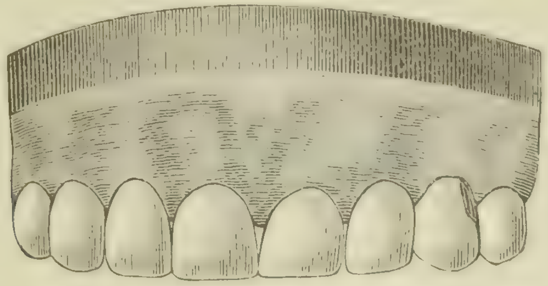


model, backed, attached to the plate with wax, and inserted in the mouth. A piece of platinum foil is then burnished to the form of the notch on the cuspid, the clasp fitted over it and attached with wax, removed with the plate, and soldered to it simultaneously with the teeth.

When the piece is finished and fitted in the mouth, the inner cap—the end of the tube having been closed with gutta-percha—is first cemented on the central root. A very small quantity of oxyphosphate is used, and while it is yet soft the plate is adjusted in position, and allowed to remain there until the cement has set. The split pivot is sprung open a little and forced to place. With the aid of the clasp around the cuspid, it will be found to perfectly secure the plate. Fig. 7 shows the bridge in position. If the plate bridge is tightly adjusted against the soft tissues, and removed in that position in the impression taken with the caps, it will always be found

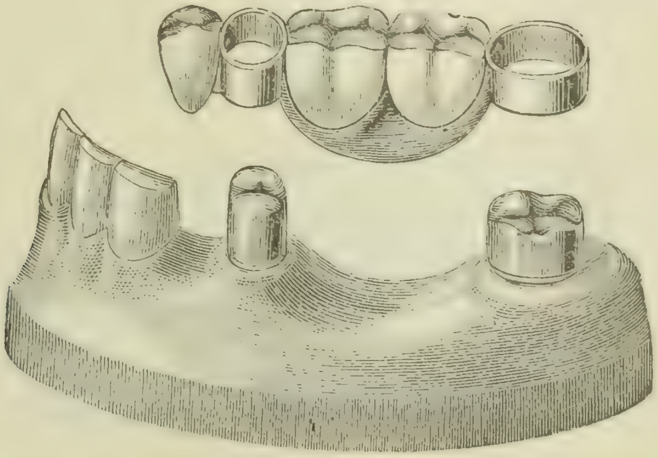
to fit in a similar manner when the bridge is finished and inserted. Should the clasp cause decay or abrasion of the cuspid, the tooth can be excavated to a slight depth under the clasp, and filled with

FIG. 7.



gold. This is best done by making a few retaining-pits, filling them with a hand plugger, and then inserting the main body of the gold by the Herbst method. Such a filling inserted at any time will pre-

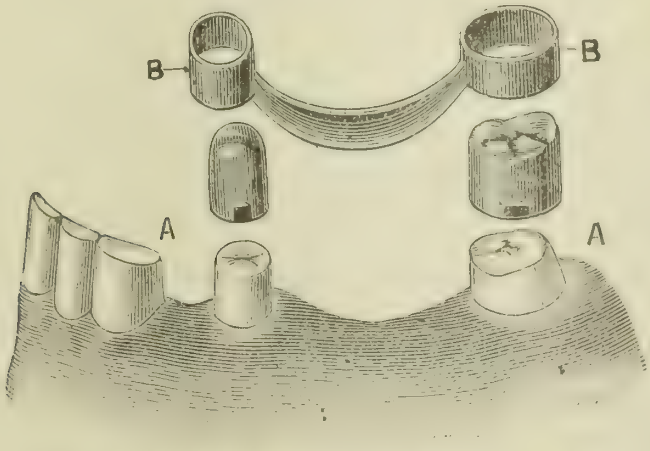
FIG. 8.



vent injury from a clasp. A denture of this style can be made to pass intervening teeth.

In the artificial replacement of the lower teeth in a case such as

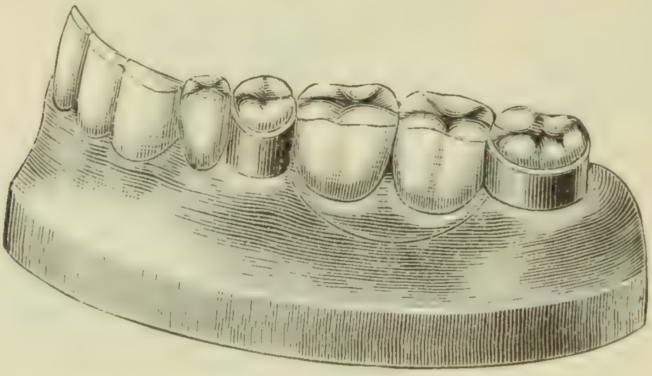
FIG. 9.



is illustrated in Fig. 8, a plate bridge possesses many advantages. In the construction of such a denture, the teeth are first properly shaped. Gold crowns (Fig. 9), the sides of which are as nearly

as possible parallel the one with the other, are then made and fitted to the bicuspid and molar. On the crowns, at the buccal sides, a narrow shoulder (A) is constructed to sustain the collars and bridge in position. In some cases this shoulder is placed on the approximal side to better advantage. The crowns are then adjusted in the mouth, a small quantity of wax being applied inside of the crowns when necessary to retain them in correct position. A piece of plate is next swaged and fitted between the crowns and attached with wax as described in the previous case. An impression and articulation of that part of the mouth are then taken with plaster, and the crowns and plate removed in it. On the model made from this impression, the crowns and plate will appear in position. Collars reaching from the cervical to the occluding edge are fitted to these crowns. They are made by first forming a collar of ample width of thin platinum, about No. 32 to No. 34 U. S. standard gauge,

Fig. 10.



which metal is easily adapted to the form of the crown, and on the outside of this fitting a slightly narrower strip of gold clasp plate, about No. 30 U. S. standard gauge. The gold and platinum are then cemented with wax, removed, invested, and soldered together with gold solder. A perfect-fitting and reliable collar is thus formed (B, Fig. 9).

The collars, though fitting accurately, should move easily over the crowns, as they can be readily tightened when the case is finished. If a collar is troublesome to adjust and remove, cut the side opposite to the one attached to the plate, and spring it open a little. After the teeth have been fitted it can then be again united when the teeth are being soldered. This collar and shoulder form a support preferable to a partial or an entire double cap, being less difficult to keep clean. A collar is more easily constructed, and also permits the position of the bridge to be altered by the removal of a little of the shoulder or of the upper edge of the collar.

The collars and plate are next cemented with wax, removed, invested, and strongly soldered together (B, B, Fig. 9). The artifi-

cial teeth are fitted in proper position on the plate by the aid of a plaster articulation, attached with wax, and, if preferred, adjusted in the mouth without the crowns. The bridge is then invested and finished. The attachment of the artificial teeth to the plate can be of either gold or rubber. Whichever is adopted, the first bicuspid is best supported by being soldered to the collar. If iridio-platinum is used in the construction instead of gold plate, and the soldering done with pure gold, porcelain body can be used. When ready to be inserted, the crowns are first adjusted with cement, and then the bridge, which is left in position until the cement sets. By burnishing the collars they can be made to clasp the crowns as firmly as desired. Fig. 10 shows the denture in position.

PROCEEDINGS OF DENTAL SOCIETIES.

JOINT MEETING OF THE AMERICAN AND SOUTHERN DENTAL ASSOCIATIONS.

(Continued from page 832.)

THIRD DAY—*Afternoon Session* (Continued).

THE Committee on Anatomy, Pathology, and Surgery was called, and Dr. Truman W. Brophy, Chicago, read the report, of which an abstract follows:

The marked advances in the science and art of surgery during the last twelve months demonstrate that the possibilities of surgery cannot be foretold. The operation which chiefly interests the oral surgeon is the transplantation of tissues. At the recent congress of German surgeons, Wolfler, of Gratz, advocated the transplantation of mucous tissue, which he had accomplished in numerous cases, from frogs, pigeons, and rabbits. Dr. C. Fenger, of Chicago, successfully transplanted mucous membrane from a rabbit to a man in blepharoplasty. Dr. Gersung, of Vienna, assistant to Prof. Billroth, accomplished the remarkable operation of transplanting nerve from a rabbit to a man, his patient being the distinguished Prof. von Fleischl. The progress of the case, two months after the operation, indicated that complete restoration of function in the fingers, the parts which were anesthetized from the loss, in consequence of neuroma, of their sensory nerves, might be looked for. Dr. Julian J. Chisholm has recently successfully transplanted a rabbit's cornea to the human eye, by Von Hippel's operation. The patient had lost the sight of both eyes from the effects of caustic lime. Union of the eyeballs to the eyelids ensued, followed by sloughing of the surfaces of the conjunctiva. The eyes had been operated upon and

the lids separated from the cornea, which remained opaque, with its surface covered by a thick layer of granulations. In a few days after Dr. Chisholm's operation the graft became adherent as in skin-grafting, and a little later the sight of the patient was restored. The operation was rendered painless to both the man and the rabbit by cocaïne. The success which has been met with in the transplanting of different tissues leads to the hope that in the near future staphylorraphy may be made successful by the appropriation of sufficient tissue from the lower animals. The report then referred briefly to the paper on implantation* by Dr. Edward C. Kirk, whose conclusion is that the implanted teeth are retained by bony anchylosis. While mucous membrane, nerves, etc., are successfully transplanted under antiseptic precautions, the conditions following such operations cannot be regarded as analogous to those which occur in the implantation of teeth. In bone-grafting, skin-grafting, etc., the graft does not substitute the part it is intended to replace, but furnishes a nucleus around which new bone is formed, the graft itself being removed by absorption. Observation of implanted teeth which have failed shows that absorption of their roots has occurred. When tissue-grafts are placed in position, immobility may be maintained; they are not subject to external disturbances. Implanted teeth are always exposed to irritants from without. If they are held by anchylosis, their early loss in the absence of the pericemental cushion would seem certain from shock, even though absorption of the roots should not occur. Whether implantation shall become a standard operation in oral surgery remains to be determined.

It has been demonstrated that in case of resection of the inferior dental nerve, redevelopment may be prevented by returning the segment of bone displaced to expose the nerve so as to close the inferior dental canal, that is, with the periphery of the bone placed inward. While the distinguished gentlemen of Europe have contributed largely to the fund of information in this department, Prof. Garretson's operation of removing the superior dental nerve at the foramen rotundum must take its place among the most important operations in oral surgery.

Dr. J. D. Patterson, Kansas City, called attention to the fact that the operation by Dr. Chisholm spoken of in the report failed finally.

Dr. John S. Marshall, Chicago, after referring briefly to the partially successful case of bone-grafting which he described before the Oral and Dental Surgery Section of the Ninth International

* Dental Cosmos, vol. xxx, p. 668.

Medical Congress, presented a pathological specimen which, he said, appears to show what he had before deemed impossible, the formation of a sequestrum in dental tissue, and he is not yet convinced. The history of the case is that two years ago there was a small cavity of decay at the gum-margin on the labial surface. A lady dentist packed the cavity with cotton to force the gum back. Every time the cotton was removed the gum bled, and after two or three months the patient went into the hands of Dr. Brophy, who, finding the pulp inflamed or dead, treated it and filled the canal perfectly with gutta-percha. When the case came under the speaker's care the tooth was extremely loose and discharged very profusely from the labial aspect of the gum. After removing a part of the gutta-percha there was hemorrhage, and in probing he found an opening through the side of the tooth which looked like a drill-hole, whereupon he extracted the tooth, which he would ask Dr. Sudduth to examine microscopically and report if it is a case of necrosis or not.

Dr. Marshall then read the hospital report of a fatal case of alveolar abscess which came into his hands at the Mercy Hospital, Chicago. The patient was a laborer on the city railroad who was admitted to the hospital April 26; pulse rapid and wiry, 105; temperature 102°; respiration 22; face badly swollen, and a peculiar crepitation manifested itself. The diagnosis was emphysematous gangrene. The swelling extended down on the neck nearly to the clavicle. Incisions had been made by the railroad surgeon on either side about an inch anterior to the angle of the jaw, that on the left unfortunately cutting off the facial artery, causing a severe hemorrhage. An offensive discharge constantly oozed out of this wound. The patient in health was a strong, robust man, with no record of former sickness. About three weeks previous to his admission the inferior left wisdom-tooth, which was decayed, became painful and sore to the touch of the tongue or of food in mastication, and shortly afterward an alveolar abscess had formed, and from thence the trouble extended to its present condition. The openings were irrigated with bichloride, 1 to 2000, and an iodoform dressing was applied. Brandy and quinine were prescribed in full doses, and all the nourishing food the patient could take. On May 2, Dr. Marshall first saw the patient, who was then etherized and the two inferior wisdom-teeth were extracted. The next day the patient spent some time sitting in his chair. On the 6th the speaker removed several large, loose masses of necrotic tissue from the region of the neck under the jaw. On the 8th profuse hemorrhage occurred on the left side where the facial artery had been severed, and the pulse immediately became weak and rapid, reaching 140. In

addition to brandy and quinine digitalis was prescribed, which decreased the heart-beats. The next day the patient was very weak and speaking with great difficulty, owing to the swollen condition of the tongue. On irrigating, the fluids passed into the mouth freely. Another large piece of necrosed tissue was removed from the right side. On the 10th the patient was still very weak, with bad diarrhea, which an opium pill checked somewhat. On the 11th another severe hemorrhage from the severed artery occurred, shortly after which the patient fainted, and died in the evening from exhaustion. The idea that this patient may have been poisoned by a filthy knife may be dismissed, as the gentleman who first operated is one of the best and most careful surgeons in Chicago. Dr. Marshall believes the case to have been simply the result of an alveolar abscess which was allowed to run too long. If the dentist who first saw the case had extracted the offending tooth or had properly treated the abscess, the patient's life would have been saved.

Dr. W. H. Atkinson, New York, thought this case emphasized the idea he had so often advocated, that we should be careful about extracting teeth where there is necrosis of the soft parts. He has no doubt that the sloughing of the right side came from debility resulting from the extraction of the tooth, and was the stepping-stone to the man's death.

Dr. J. Y. Crawford, Nashville, Tenn., is satisfied that the profession at large does not fully appreciate the influence that affections of the wisdom-teeth may have in the production of serious consequences. He recalls a case in which a gentleman was seeking various health resorts to overcome a supposed attack of phthisis, for whom the removal of an impacted wisdom-tooth afforded prompt relief. He is surprised to hear Dr. Atkinson make the broad declaration that teeth should not be extracted from dead or necrotic tissues. Almost every dentist has extracted teeth under such circumstances. That a fresh wound in close proximity to a septic condition might be deleterious is true, but under the circumstances described there would seem to have been no other course but to extract the offending member.

Dr. J. D. Patterson, Kansas City, thought the first mistake was in the severing of the facial artery, which led at last to the exhaustion that caused death.

Dr. W. Xavier Sudduth, Philadelphia, wished to commend the report on implantation by Dr. H. A. Smith. Implantation has attracted much interest during the past two or three years, and as now performed he looks upon it favorably. The dental profession is to be congratulated on having introduced and developed this class of operations. The old operations of replantation and transplanta-

tion were generally failures. Why? In replanting operations the tooth was extracted because it and its surroundings were in an unhealthy condition. If the end of the root was roughened by absorption, it was smoothed off and the tooth replaced in tissues which were in a chronic catarrhal condition, so that there was everything against its becoming a healthy member. In transplantation the conditions were nearly the same. Implantation is an entirely different operation. The tooth to be implanted is carefully selected, treated antiseptically, and placed in a socket made for it in healthy tissue. There is therefore no comparison between this procedure and the older operations. The method of attachment can be understood by studying histologically the process of repair in tissues in general. A wound is made in healthy tissue, and lymph is thrown out which organizes into connective tissue. The original attachment of the tooth was fibrous, but in implantation the root is surrounded by freshly wounded bone-tissue, and if the inflammatory condition be kept just right so as to be an irritant stimulant, bone-formation proceeds, and bony anchylosis occurs. He has been noting carefully the work done by Dr. Edward C. Kirk, to whom belongs much of the credit of putting the operation on a scientific basis. Dr. Kirk has studied the subject of antiseptics. With the present understanding of antiseptics the operation of implantation is much more likely to be successful than it could have been ten or fifteen years ago. In thirty-three cases operated on by Dr. Kirk the teeth have become firmly attached. So far the speaker has been unable to make histological examinations of successful cases, but he hoped to make experiments on the lower animals, the result of which will be reported. At present all that can be advanced regarding the method of attachment is the theory of anchylosis before referred to. The firmness of the implanted teeth in their sockets, the absence of the slight mobility of natural teeth, and a peculiar resonance given forth when they are tapped with a steel instrument, seem to confirm this. The pericementum of the natural teeth forms a sort of cushion which lessens the shock of mastication. There is no such cushion on implanted teeth, which thus receive a severer shock in mastication than the natural teeth, and are consequently weaker than their neighbors, and will fail first in the mouth. That is the theory. But if they last five or six years and the operation can be made painless, why may not implantation be recommended as a proper procedure? Dr. Marshall's intelligent application of bone grafts stamps him as one of the leaders in the transplantation of bone-tissue.

Dr. W. H. Morgan, Nashville, has not performed the operation of implantation, but he greatly fears that those who have are treading over a volcano, and that one of these days there will be very serious

results from the introduction of dead teeth into the animal organization. As to the method of attachment in these cases, his view is that the foreign tooth is simply encysted. He does not accept the idea of bony anchylosis, as that is a union of living parts which could not occur in these cases, where the formation is rather a fibrous connective tissue. The tooth is merely tolerated while the surrounding tissue maintains its vitality. When that is lost, nature throws out the tooth as a foreign member. He has seen instances of bits of steel projected into the hands of men who made mill-stones becoming encysted, and no trouble following. But in implantation many cases do give trouble, justifying the belief that all cases will ultimately result in failure. One word about the wisdom-teeth. He is sure they do not attract sufficient attention in examinations of the mouth. There are but few cases in which the gum overlaps the posterior part of the tooth where there is not more or less disease which demands attention. Sometimes an ichorous discharge drips down into the throat, causing serious trouble. Some years ago he treated a case in which a large abscess had formed. When he first saw it the trouble had been progressing for ten or fifteen days; the jaw was much enlarged, the swelling extending downward nearly to the clavicle, and upward quite to the temple. An incision was made just in front of the angle of the jaw, and a great quantity of offensive matter discharged. On syringing out the cavity with tepid water, the cartilage lining the glenoid cavity protruded, and the expectation was an anchylosis; but by constant care, washing out the cavity with tepid water and then with iodine and water, this was avoided. The whole trouble arose from the roots of a wisdom-tooth and an attempted extraction of them.

Dr. B. H. Catching is glad to hear the opinion that an implanted tooth is held by anchylosis. He is experimenting in the implantation of porcelain teeth, which he expects to be held by gomphosis. All the experiments so far are getting along very well.

Dr. Marshall, replying to Dr. Atkinson, said that if Dr. A. had listened as carefully as he usually did, he would have learned that after the extraction of the teeth the man continued to improve up to the time when the ligature on the facial artery sloughed off and he had a sinking spell, from which he was revived, but in two days another tremendous hemorrhage occurred and he died.

Dr. Atkinson rejoined that the idea he had suggested was a better conclusion than that advanced by Dr. Marshall, because the disease was emphysematous necrosis, which is necrosis of soft tissues. What constitutes crepitation?

Dr. Marshall. Liquid.

Dr. Atkinson. Not at all. It does not come from palpation of

liquids, but must be of gases, set free by the disintegration of the molecules of tissues.

Dr. Marshall. Do you mean to say that if the hemorrhage had not occurred the patient would have died?

Dr. Atkinson. I do not. You said that this bad-smelling material was taken away. How came that side to be sloughing off?

Dr. Marshall. By extension of the disease by burrowing.

Dr. Atkinson. I beg your pardon, unless you call carrying the forceps from one place to another burrowing.

Dr. Marshall. The swelling was on both sides of the jaw, and both sides had been opened up before I saw the man.

Dr. Atkinson. It was my earnest advice to my brethren to be cautious about extracting teeth when there was a necrotic condition of the soft tissues. The tooth that was extracted should have been allowed to remain in the jaw, if the jaw was shut so tightly that it had to be opened under anesthesia.

Dr. Marshall. I have made all the point I wished to make to show that the man died of hemorrhage.

Adjourned till to-morrow morning at 9.30 o'clock.

Fourth Day—*Morning Session.*

The joint meeting convened pursuant to adjournment, President Catching in the chair.

Dr. Brophy, referring to the specimen of apparent necrosis shown by Dr. Marshall, said that the root was opened and filled, the trouble having been, in the first place, an exposed pulp, which was destroyed. There was no attempt to drill, hence the opening in the side could not have been caused by that means. His opinion is that pericementitis had existed for a long time before the pulp was destroyed. With reference to the hospital case related by Dr. Marshall, we do not know that the diseased wisdom-tooth was the origin of the disease, and in any event, the removal of the tooth on the side not affected by abscess was scarcely justifiable, for the tissues were breaking down, and through the removal and the consequent opening of the vessels the production of septicemia might have resulted. Under such circumstances it would have been better not to extract. The actual cause of death was undoubtedly the debility resulting from loss of blood and the septicemia. As to implantation, he is not a very ardent advocate of the operation, though he hopes it may be successful. As he said in the report, if the tooth is fixed by anchylosis and becomes firmly attached, it may break down very soon from shock. The pericementum is a cushion which prevents this shock and enables the tooth to move slightly when brought forcibly into contact with anything.

Dr. Marshall wished to say in reply to Dr. Brophy's criticism of the removal of the tooth from the left side of the jaw that the man began to improve from the time of its removal, and he would probably have gotten well but for the recurrent hemorrhage. He thought some of the gentlemen did not take into consideration the fact that he had related a failure, which requires some courage, more than is needed in presenting a success.

The president was of the opinion that if more failures were reported dentistry would be better off.

Dr. Atkinson. It is not always safe to use peroxide of hydrogen if you care for the comfort of the patient. He has seen multilocular abscesses after treatment with this drug distended, bloodless, entirely white all along the gum. We should be careful to try and get a good quality of peroxide and keep it in a cool place, as the extra equivalent of oxygen is readily disassociated at 65° F. He would advise washing out the chamber with warm salt water; then use a solution of carbonate of soda, which makes soap of the remaining débris, then dry with bibulous paper, when the peroxide of hydrogen may be applied with a considerable degree of comfort. After the bubbles cease to appear, dry with bibulous paper or by other means, and put in the disinfectant.

Dr. H. E. Beach, Clarksville, Tenn., referring to the assertion that implanted teeth are held in position by anchylosis, said that he could not see how there could be any connection between a dead bone and a living one. Unless the membrane on the roots of dead teeth becomes alive, anchylosis cannot be accounted for. There may be a provisional callus thrown out from the live periosteum of the alveolar process, by which an incasement of the dead tooth is effected, but union with the dead bone seems an impossibility.

Dr. Frank Abbott, New York, desired to call attention to the method of retention of implanted teeth. The microscope shows that the tooth is not held by gomphosis nor by anchylosis. A socket is dug out in the alveolar process and shaped to the root of the tooth. In many instances it requires some force to place the tooth, so that it does not require a ligature. The inflammation in the bone produced by the operation causes granulations to be thrown out, and the surface of the root becomes dissolved out in spots by a melting down, which goes on under inflammatory conditions. Into these the granulations adapt themselves, and thus the tooth is held in place. If the tooth is not fitted tightly, micro-organisms are liable to develop in the pockets left there, or any pericementum left on the root may undergo putrefactive decomposition. These are some of the causes of the destruction of the attachment.

Dr. Morgan understood Dr. Abbott to speak of inflammation in

dead tissue. The term inflammation is used with reference to the reproductive process in living tissues, but he questions whether it is correct. In such conditions the inflammatory process is benign and does not deserve the name inflammation. It is more an irritation. He has held from the first that implanted teeth were retained in position in the way described by Dr. Abbott.

Dr. Abbott. The first step toward inflammation is irritation, but just where irritation ends and inflammation begins is difficult to determine.

Dr. H. A. Smith, Cincinnati, had failed, in preparing his paper, to mention the fact that several of the gentlemen who had reported their cases to him called attention to the fact that a tight fit, requiring the tooth to be driven into the socket forcibly, produced a high grade of inflammation, thus bringing about a retrograde metamorphosis and destruction of the tissue. They therefore advise that the root fit the socket accurately, so that force will be unnecessary in placing it.

Dr. Sudduth. If the attachment is fibrous, how is it that in successful cases the tooth is perfectly immovable, and gives forth a sharp, resonant sound when tapped with an instrument?

Dr. F. Peabody, Louisville, Ky., wished to ask, if the tooth is held by the impingement of the alveolar process, the reproduced process adapting itself to the inequalities of the root, would a perfectly cone-shaped root be held in the same way?

Dr. Abbott thought it would not.

Dr. Catching holds with Dr. Sudduth that in many cases there is anchylosis. Dr. Chisholm, of Tuscaloosa, Ala., implanted a tooth which for some reason it was desirable to remove, when it was found that it could not be done, as there was complete anchylosis, and the tooth had to be cut off and left firmly attached to the process.

Dr. Taft disagrees with Dr. Abbott's statement that there can be union of living with dead tissue. The tooth implanted is structurally like the original, and so far ready to receive the granulations. Sponge-grafting ought to throw some light on the subject. When a sponge is properly placed in a prepared cavity, plasm is thrown into it; organization takes place in the interstices and granulation occurs. The sponge is not living any more than the cementum of a tooth placed in a socket. The organic material of the cementum is there ready to receive the plasm thrown out from the walls of the socket, and actual union may take place. It may readily be that calcareous material is thrown into the new territory and union is accomplished. Upon no other hypothesis can the case of Dr. Chisholm and the facts stated by Dr. Sudduth be explained.

The subject was passed, and on motion of Dr. Taft it was ordered

that the reports and papers in the hands of the joint committees be read in succession, after which if time permitted they should be taken up and discussed in the order of their presentation.

Dr. J. Rollo Knapp, New Orleans, read the report of the Joint Committee on Prosthetic Dentistry, Metallurgy, and Chemistry, which had found it scarcely practicable to present even a partial list of all that has been suggested, attempted, or effected since the last meeting of the association. The comprehensive "American System of Dentistry" has been completed and stands as a monument to the genius, erudition, and devoted labor of American dentists. The committee also commends several other recent books within its scope: "The Dentist's Manual of Special Chemistry," by Dr. Clifford Mitchell; "The Student's Manual and Hand-book for the Dental Laboratory," by Dr. L. P. Haskell; Dr. Guilford's and Dr. Buxton's works on "Anesthetics;" while a second edition of Essig's "Dental Metallurgy" is a welcome proof of the appreciation in which the original work is held. A fourth edition of Richardson's "Mechanical Dentistry," revised, enlarged, and greatly improved, has also appeared. To those versed in the French language Dr. Andrieu's "Traité de Prothèse Buccale et de Mécanique Dentaire" will be found interesting and instructive. To invite discussion the committee suggests the careful consideration of the dental uses of aluminium, of which in 1851 it was said that "It is prepared with too great difficulty to be useful in the arts in its separate state." Since that time, however, the methods of manufacture have been simplified until the metal now sells at about half the price of silver and is likely soon to compete with iron. One difficulty in the way of its complete availability in dentistry is its contractility in cooling; another is its liability to attack by certain agents. Richardson repeats the declaration of Figuier that "common salt and acetic acid (vinegar), especially when mixed, attack and dissolve aluminium." Essig says, "The readiness, however, with which it is attacked by alkaline solutions, renders it unfit for use in the construction of a permanent artificial denture."

The committee also called attention to a somewhat similar uncertainty regarding the use of cocaïne, the reported experiences with which, both in this country and in Europe, justify insistence upon the greatest care in the use of the drug as a local anesthetic. The report of the meeting of the Odontological Society of Great Britain, November, 1887, gives a variety of important suggestions as to the chemical constitution of the alkaloid, particularly as affected by hygrine and other disturbing elements; and Ott, in the fifteenth edition of the "United States Dispensatory," suggests the ill effects to

be expected when it acts unfavorably. He says, "It tetanizes frogs, or in overwhelming doses paralyzes the sensory nerves and posterior columns. Rabbits and dogs are killed by it, through paralysis of the respiratory centers."

A gratifying proof of professional advancement is afforded in the matter of crown- and bridge-work, in which direction American methods, American practitioners, and American success have won pronounced admiration in England. The committee takes pleasure in calling attention to the splendid presentation of the subject in a volume by Dr. Geo. Evans, entitled "Artificial Crown- and Bridge-Work," which contains an immense amount of practical information.

Dr. D. Genese, Baltimore, read a paper entitled "Rubber and how to Use it," which was a plea for a better method of manipulating rubber, so as to place its advantages on the highest plane. A plate made of rubber which has come in contact with oily substances before or during the vulcanizing, will be soft and spongy, with an affinity for greasy matters, which soon decompose it and sore mouth results. In modeling nothing but the finest plaster should be used, and it should be mixed by dropping a little at a time into the water, allowing it to settle at the bottom, and then pouring off the excess of water. Models should be dried in warm air and not used for two days after casting. Small flasks should not be used. Steam at high pressure only can be relied on to remove oily wax and paraffine from the molds or upon the pins and backs of teeth. The molds should be kept hot and be coated with tin foil when placing the rubber in them. Rubber exposed to dry heated air, as when placed in an oven, soon begins to take the form of vulcanite, which causes fracture of the model by the resistance of the hardened surface to pressure. Dr. Genese then showed an apparatus which he had devised to overcome the difficulties he had mentioned, and passed around specimens showing the differences between work made by the plan he advocated and the usual methods.

Dr. John S. Marshall, Chicago, offered the following resolutions, which were adopted:

WHEREAS, It is the sense and belief of the American Dental and the Southern Dental Associations, in Joint Meeting assembled, that the tariff on imported dental and surgical goods works a hardship upon the profession and the public; therefore, be it

Resolved, That we memorialize Congress to abolish all duties upon imported dental and surgical instruments, apparatus, and supplies.

Resolved, That the secretaries of the associations be instructed to forward this resolution to the proper authorities in Congress, and that each member of the associations be requested to use his influence with the Congressman of his district to vote to place the above-mentioned goods upon the free list.

(To be continued.)

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting Tuesday evening, October 9, 1888, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street. The president, Dr. J. Morgan Howe, in the chair.

The minutes of the last regular meeting were read and approved.

The minutes of an adjourned meeting held at the residence of Dr. C. E. Francis, Glenbrook, Conn., on June 14, were read as follows:

"An adjourned meeting of the New York Odontological Society was held at Glenbrook, Conn., on the afternoon of Thursday, June 14, 1888, where the members of the society and a few invited guests, numbering about fifty persons, were very cordially welcomed and entertained at the delightful and hospitable home of our honored brother and host, Dr. Charles E. Francis. After a brief rest at his house, the afternoon was spent in strolling through his extensive and beautiful grounds, along the banks of the winding stream, or resting beneath the shades of the forest trees, with which his grounds are abundantly adorned.

"The subject for consideration at this meeting, 'What Professional Men Need,' was discussed in a very practical way by deeds as well as words, and, judging from the evident enjoyment of all present, the prevailing sentiment seemed to be that professional men need occasionally a day of recreation, for relaxation of body and mind, rest from fatigue incident to the labors of our profession, and a renewal of the entire man; and this could be accomplished best by spending a bright June afternoon in the country, and at the charming home of our honored host, amid the waving trees and grasses, the rippling waters, and the songs of birds.

"After spending a delightful afternoon in a very social and enjoyable manner, all repaired to the house of our host, where refreshments in great variety and abundance were served,—another evidence as to 'what professional men need' for a renewal of strength and satisfaction of the inner man. Then followed a social feast for an hour, after which the meeting adjourned, all feeling this to be one of the most enjoyable meetings of the kind ever held in the country.

"S. F. Howland, *Recording Secretary.*"

Dr. W. H. Dwinelle. Mr. President, I am glad that a reference, so beautifully expressed, has been made to the delightful meeting we had at the country-seat of Dr. Francis last summer. It was

truly an enjoyable affair, but there was one oversight. Owing to hurry and lack of time, when we were leaving we failed to express to our worthy friend our high appreciation of his kindness and our satisfaction with our visit there; and as this is the first regular meeting since that occasion, it seems appropriate that we should take this opportunity to correct the oversight we made, therefore I rise to offer a resolution to the effect that we fully appreciate his kindness, and recognize in him one of our most beloved members; also that the record of that meeting which the secretary has read be embodied in this resolution and sent to our friend Dr. Francis.

The resolution was adopted unanimously.

The corresponding secretary read a graceful letter of thanks from Sir Edwin Saunders, of London, and also the following communication, which refers to some statements made upon gutta-percha by Dr. J. Foster Flagg, who addressed the society in February, 1888:

"1 Mt. Vernon Street, Boston, April 9, 1888.

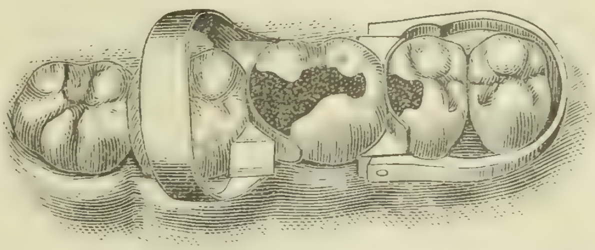
"Dear Mr. President: I cannot be present at the New York Odontological Society meeting on the 10th, but wish to say that for many years I have made *water-tight* gutta-percha fillings by first varnishing the *dried* cavities with a thin solution of resin (common 'rosin') in chloroform or chloric ether.

"Yours truly,

"Jacob L. Williams."

Incidents of Office Practice.

Dr. S. G. Perry. If I may be allowed, I will show a little device for holding matrices in place. It is simply a rubber-dam clamp with two little wedge-shaped lugs to engage between the teeth in such a manner as to steady a thin matrix; the matrices being made of the



thinnest of steel and shaped so as to be pressed under the gum in some cases. The second one is a curved bow of steel shaped like the bail of a pail, with two similar wedge-shaped lugs on the ends. These lugs swivel so that there is a ready adjustment to the different teeth. The bow is sprung open and adjusted by the clamp-pliers. (See illustration.) I have been using a slight modification of this form a great deal during the last two years, and

although I have two other devices, I find myself unconsciously taking this up and using it more than any other. They hold the matrix in most cases sufficiently steady to admit of packing gold against it. One advantage is that they are very quickly applied. They can be adjusted and taken off in a moment. As to the amount of spring or movement that may occur, I must say that this is often an advantage in packing gold. I hardly think I like a matrix that is so firm that it will not yield a little; so that which might seem to be an objection at first thought I have found in practice is not so. I have still another form of this with a cross-bar and screw by which the lugs can be held immovable when absolute firmness of the matrix is required.

Dr. J. B. Lawrence exhibited a piece of ancient bridge-work skillfully carved from rhinoceros-tusk, the tusk enamel being preserved to form the face of the piece. Much interest was taken in the piece, for it was skillfully made, and had seen years of service in some mouth of a previous generation.

Dr. Dwinelle. I am very glad the doctor has introduced this bridge-piece. The subject of bridge-work is a very interesting one to me. This piece reminds me of one that was made for my father when he was in Congress. It was made by a French dentist at Washington, in 1822. It was like this, except that it embraced six teeth and was sustained by pivots placed in the eye-teeth. It was carved from a hippopotamus-tusk, the enamel being retained on the outside. How far this case would bear upon the Low system of bridge-work I do not know, but I hope we will have an opportunity before long to find out.

The president stated that for several good reasons it might be advisable to change the night for holding the meetings of the society from the second to the third Tuesday of each month, thus returning to the old custom of the society.

After some discussion, it was voted to instruct the Executive Committee to secure the parlors of the Academy of Medicine for the third Tuesday in the month instead of the second Tuesday, and an amendment to the by-laws was offered changing the night of meeting.

Dr. Dwight M. Clapp, of Boston, was here introduced and read a paper entitled, "A Method of combining Amalgam and Gold, securing a Firm Union between the Two, and completing the Filling at One Sitting."

[Dr. Clapp's paper may be found at page 870 of this issue of the Dental Cosmos.—Ed.]

Dr. Clapp showed specimens of fillings made by the method described.

Dr. S. E. Davenport. I wish to acknowledge my obligation to Dr. Clapp for his very clear description of this method of combining gold and amalgam and finishing the operation at one sitting. Since the subject was advanced in so clear a manner by Dr. Kingsley some years ago, I feel sure that the experiment has been tried by almost all of us, and I think probably with many the result has been the same that I have experienced, one of failure and dissatisfaction. I have made many fillings of combined amalgam and gold and finished them at the same sitting, making the lower portion of the filling with amalgam against a matrix of some character, and then anchoring the gold in undercuts in the crown and building out upon the amalgam and against the matrix. That method of course gives only the strength to be derived from the undercuts in the crown, for there is no homogeneous effect at the junction of the gold and amalgam. Dr. Clapp's method is of course greatly superior to that, and makes practicable a class of work which we have all along recognized as possessing many good qualities and almost no objections if the two metals could be made homogeneous. I would like to ask Dr. Clapp one or two questions, if he will allow. In making contour fillings—and, by the way, I am very glad to hear him speak so decidedly in favor of them—I would like to know whether he makes the knuckle of amalgam, or whether he begins the gold far enough down to form the knuckle of gold. Also, if he will kindly tell us a little more about this special gold that he uses, and whether he thinks the success of this method is due entirely to that gold.

Dr. Clapp. As a rule I form the greater part of the knuckle with amalgam, though that depends entirely on circumstances. As regards this gold, we have to come to New York for it, and my success dates from its use. I have tried times without number, almost, to place foil onto fresh amalgam and make it stick, and I never have succeeded. The only way in which I can use foil in these cases successfully is by having a cavity deep enough to enable me to start the gold as a wedge-filling, and then proceed as with an ordinary filling; but Steurer's gold can be added immediately to the fresh amalgam and worked straight along without a moment's pause from the beginning to the end of the operation; and I never have failed to make a satisfactory union. I think it can be done with Watts's crystal gold, though I have tried that but once, and then had considerable trouble with it, the same as with the foil, but with Steurer's plastic gold I have never had any trouble whatever. I accidentally found out that I could do this, and from that accident I have worked.

The President. Does Dr. Clapp finish the operation with the same gold?

Dr. Clapp. That depends entirely on the case. I have finished

many fillings with that same gold. But it is not material; any cohesive gold can be used for the finish.

Dr. F. A. Remington. It will be found that Williams's Crystalloid gold will answer for this combination, and there is no waste about it if it is properly manipulated.

Dr. Perry. I am delighted with the close attention to details shown in this paper. To my mind that is most important, and I have no doubt that Dr. Clapp is a good operator, although I have not seen any of his work. A man cannot take that care in the details without securing good results. I have never filled teeth exactly in that manner, but the combination of gold and amalgam in some form is desirable for the purpose of getting the result which the doctor has described; the gold is best for the grinding-surface, and the amalgam gives the condition that is most desirable at the cervical border. The method also aids very greatly in the restoration of contour, which I need not say is an important point. I have been in the habit for many years of getting results something like those described, but in a very different manner; that is, by making a third or a half of the filling near the cervical border with amalgam, and then, after a day or two, completing the operation with gold. That avoids the possibility of smearing the gold with mercury, or disturbing the foundation of the filling before it has hardened. Dr. Clapp has managed his matrix so neatly, winding it so many times with silk, that he gets it fixed sufficiently firm and secure to withstand the impact of applying the gold; and I do not doubt that he gets excellent results with the advantage of making the operation at a single sitting, thereby saving the patient considerable strain, and the dentist as well. I think it is safe to prophesy that fillings of that sort will be used hereafter more than they have been. What copper amalgam will do in the way of making good grinding-surfaces and contours remains to be seen. I have had good results with it so far on the grinding-surfaces and the corners of fillings, but I am not sure that that filling-material will take the place of this combination.

The President. Dr. Clapp hands me several teeth containing large amalgam fillings which have the appearance of age. But the fillings show very plainly the imperfections on the grinding-surface that we are all so well acquainted with and which he has so accurately pointed out in his paper.

Dr. Ottolengui. A word in regard to the matrix which the doctor uses. I have had shown me a matrix very similar to it, but which has, I think, one advantage over it. I first learned of it in Boston this summer from Dr. Gilson, of that city. He takes a piece of metal plate, such as Dr. Clapp uses, but twice as wide as the matrix

is to be, lays his silk thread across the center and then folds the metal over, leaving the silk lying around the lower edge, between the folds; then burnishes it down with a burnisher. This makes it firm and less likely to break, and the silk is wound around the neck of the tooth down near the border of the gum and tied securely against the lower margin. Since Dr. Gilson showed me this arrangement I have been using no other matrix, and I have found it excellent indeed.

Dr. Clapp. The matrix which Dr. Ottolengui has described I used for a long time, but have discarded it for several reasons. In the first place, its lower edge is necessarily straight, which is an objection, for often the festoon of the gum comes up on each side of the cavity, and a straight matrix could not in such a case be made to fit down below the cervical margin. It is a nice matrix in some cases, but the two thicknesses of metal cannot be burnished against the tooth as well as one thickness can. Another thing, when the ligature is placed in position between the folded metal and is carried around the tooth, it very often gets down in between the folds of the matrix when the space is narrow, or caught on the corners, and gives much trouble. It is a very good matrix, however, and I have used it a great deal, but it seems to me that, everything considered, the other is a better one.

I would like to read a short extract from a letter which I recently received from Dr. Cheney, of St. Johnsbury, Vt. Last July, at the union meeting in Boston, I put in one of these fillings for Dr. Cheney. I had absolutely no undercut for the retention of the gold; the amalgam was almost even with the cavity, so there was no possible chance of the gold being retained in any way except by its union with the amalgam. I made inquiry of him a few days ago in regard to the filling, and this is what he wrote me in reply:

"The filling you put in for me in July is in good condition, and I am very much pleased with it. . . . As you know, I am a firm believer in the combination of two metals in a cavity. . . . I am convinced that I have controlled thermal trouble in several teeth where I have used this combination of gold and amalgam."

I think that one of the strongest arguments in favor of this combination is that thermal and galvanic troubles are almost entirely obviated.

Dr. Dwinelle. I have been in the habit for a good many years of putting a lining of amalgam in the cervical portion of certain cavities, and then filling with gold, and sometimes I have filled a considerable portion of the cavities, especially those on the posterior proximate surfaces, with amalgam, and have had no trouble from galvanic action. When looking over some teeth to-day that I have for various

reasons extracted, and which I filled many years ago. I remembered their histories; and although there is a considerable mass of amalgam, and considerable gold also, sometimes one-half of each, there was no indication of galvanic action. This used to be a bugbear in the profession a few years ago, but it seems to have disappeared. I have known a few cases of such galvanic action, but it was sure to pass away in a short time.

A word in regard to mercury. We are all troubled more or less with an excess of mercury in amalgam fillings, especially when we are finishing the operation. I have been in the habit lately of taking a portion of the amalgam I am using and holding it in a spoon-shaped instrument, something like a grooved flat burnisher, over a lamp until a part of the mercury is evaporated and it is quite stiff, and then laying the dry amalgam upon the filling, from the surface of which the excess of mercury is immediately taken up. In that way I am enabled to obtain a hard and quick-setting amalgam, and so far I have not observed that it impairs the integrity of the filling.

The president introduced Dr. J. B. Lawrence, of New York City, who read a paper entitled, "A Knowledge of Physiological Assimilation Indispensable to Scientific Medicine and Dentistry."

Dr. V. H. Jackson. I rise to take exception to one assertion in the doctor's paper. As I understand him, he would lead us to believe that the feeding of phosphate in any particular form would not be of service to the human body; and that the feeding of any particular food would not increase the supply of phosphates. Now we know that wheat is the richest in phosphates of all the cereals, and that the hull of the grain, which contains about 90 per cent., is largely taken off in the manufacture of flour; and we believe that the hull, which is so rich in phosphates, is readily assimilated by the system, and would supply the body with the deficient nutriment and thus improve the tissues. It seems to me that it is well for us to prescribe for our patients Graham bread, or breads that have not been robbed of the phosphates. That has been taught by scientific men for years. Throughout our State where the soil has, from continuous cropping, become exhausted of its phosphates, phosphates are sown extensively, not only to give more thrift to the stalk of the grain, but to assist in developing a better form of kernel and more of them. Cattle that roam over fields which are deficient in phosphates become diseased, but are readily cured by being fed upon bone-meal or fodder containing the lacking phosphates. We know that in cases of softening of the bones, they become hard when

phosphates are administered. These facts teach us that phosphate-feeding in certain cases is advantageous. I am a strong advocate of supplying artificially the general lack of phosphate in our food.

Dr. Lawrence. I desire to state that this subject was brought to my attention some fifteen years ago by Dr. Atkinson, and, charmed with it, I began research and clinical experimentation, resorting to chemical analysis, under the direction of the late Professor Draper. The conclusions arrived at were that softened dental and osseous tissues revealing a deficiency in the lime-salts were also wanting in other elements; that the condition was not primarily a lesion, but one of the symptoms of general physiological aberration; and while it is to be admitted that the calcific ingredients apparently contribute most to the mechanical integrity of these tissues, and on this account suggest, perhaps, their use as a remedy, still, the exhibition of the so-called "Vitalized Phosphates" would not necessarily supply the want; on the contrary, their use will often aggravate and intensify the symptoms, and finally, the practice is unscientific and empirical from a physiological stand-point. It is to be conceded that in some cases the "acid phosphates" do indirectly modify these symptoms of constitutional derangement, but in these cases it will be found that the success depends upon improved digestion by reason of the presence of the acid in the stomach, and it is easy to see that this result can be attained by more simple and convenient means, as by the use of citric acid or lemon-juice.

Moreover, the standard authors will in vain be consulted for an authenticated case in which the administration of phosphates alone has proven efficacious in the restoration of these impaired tissues.

I am aware that it is a somewhat common practice to prescribe these preparations in the case of pregnant women, but an analysis of the secretions and excretions proves that the excess of their administration appears in inverse ratio in the urine; in fact, they will be found to have passed the economy unassimilated; the excess shows that their unwelcome presence aggravated the lesion.

In the last edition of Gross the entire theory is very well epitomized and the views of the standard authors faithfully reflected, and, aside from my own experience, I find no support for this unphilosophical dogma.

Dr. Jackson. I have also read some little on this subject, including physiological and pathological chemistry, and I have not only good authority, but I have some patients whose cases will bear me out in the statement that the results of phosphate-feeding in actual practice are beneficial. I have used phosphates quite extensively, and I have also used lime-water, and am satisfied that

soft teeth can be made harder by the judicious prescribing of phosphates. I know that the use of phosphates has been carried to excess and probably will be, but I am convinced that the judicious use of them will prove beneficial. Preventive dentistry should be the aim of the future dentist. It is the mission of dental specialists to solve that problem, how best to prevent decay. We should not look on the writings of Gross, or of any other man, as conclusive, if we have before us the results of actual practice which contradict them. I can present patients who will tell you that equal parts of Horsford's Acid Phosphate and Fellows's Hypophosphites of Lime and Soda have greatly benefited them. That combination is being prescribed by one of the most eminent physicians in New York. I have many times prescribed lactophosphates of lime with benefit. I know a dentist who believes that the greater strength and vigor of one of his children was due to the fact of phosphate-feeding during the period of gestation. Some years ago I read a paper on this subject before the Harlem Medical Association. Several members of that association have practiced phosphate-feeding with advantage, more notably the younger physicians.

In H. C. Wood's "Therapeutics, Materia Medica, and Toxicology" we find many interesting facts:

"Whenever the phosphates are taken out of the food of animals, although they be otherwise well fed, sooner or later they sicken and die. . . . Chossat fed pigeons exclusively on corn containing very little of the phosphate of calcium, and found that after some months they wasted, were affected with diarrhœa, and died. . . . A herd of cows which had been fed upon hay from a certain meadow were very much out of health. On examination, the hay was found nearly free from earthy salts, and upon bone-meal being given to the cows they recovered their health. Cattle fed exclusively upon potatoes, or upon roots very poor in phosphates, fail to fatten, become weak, and are apt to suffer from caries, but if the phosphate of calcium is given they rapidly improve. . . . If the drug be given to those wet-nurses whose milk contains an abnormally small amount of phosphates, the milk soon becomes rich in the earthy salts. . . . Is used extensively in rachitis or softening of the spinal bones, with benefit. Cases are not rare of children of slow development, often seemingly well nourished and robust, and yet really pale and with flabby flesh, but without any distinct symptoms or marks of scrofulosis or of rachitis. Of the value of phosphate of calcium in these cases I have no doubt. Beneke calls attention to its use during pregnancy, and believes that it exerts an influence on the fœtus, so that women who have borne, it may be, only rachitic or scrofulous children, will bring forth healthy offspring."

Dr. Dwinelle. The subject of phosphates is a very important one. Allusion has been made to the wheat kernel. There is no doubt in my mind that it is a great mistake to refine wheat until all the phosphates are removed from it. I believe there are four or five capsules or coverings of the wheat berry, and in ruling them out in the manufacture of flour we rule out a very important element of the wheat, to wit, the phosphates. My stomach rebels every time I eat white flour bread, and when I return to the whole-grain flour I have no trouble. I have made this subject of phosphates a very prominent one, and am delighted to know that the medical fraternity are paying more attention to it now than they have heretofore. I have in my possession some phosphate of lime prepared by Parke & Davis, I think, of Detroit, and my patients are using it very generally, uniting it with their food and keeping it on the table, and I am satisfied that they and their teeth are thriving under it. Phosphates have always been recognized as a tonic medicine for building up waste tissue and giving tone and vigor to the nervous system. I hope that we shall pay more attention to this subject than we have heretofore done. It interests us as a profession more than any other. Our teeth are largely made up of carbonates and phosphates, the enamel almost exclusively so.

We can, as we all know, change perceptibly the constituents of our young patients' teeth within a few months' time. By the process of refining wheat flour it is subjected to a loss of three-fourths of its ash, three-fourths of its phosphoric acid, five-sixths of its lime and soda, all of the sulphur and sulphuric acid which is contained in the whole-wheat berry.

The peasantry of Austria and Hungary, and indeed of Europe in general, prefer their bread made from the whole meal, because of its nutritive value,—because the laborer can be sustained on such bread, and cannot on the white. The Roman soldier subsisted entirely on the whole-wheat uncooked grain which he carried in his knapsack.

A treatise on Artificial Crown- and Bridge-Work, by Dr. George Evans, was received with the compliments of the author, and was on motion accepted, the thanks of the society to be tendered to Dr. Evans.

On motion of Dr. Brockway, a vote of thanks was given to the essayists of the evening for their instructive papers.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor New York Odontological Society.

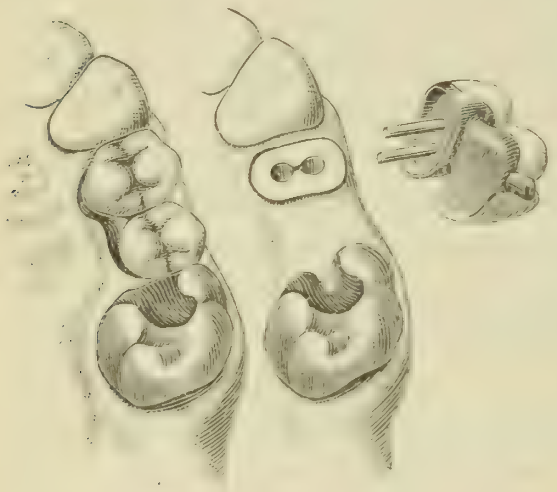
FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

THE First District Dental Society of the State of New York held a regular monthly meeting, Monday evening, October 1, 1888, in the Hall of the New York Academy of Medicine, No. 12 West Thirty-first street. The president, Dr. W. W. Walker, in the chair.

Dr. Meyer L. Rhein, chairman of the Clinic Committee, read the following

CLINIC REPORT.

A stated clinic of this society was held this afternoon at the depot of The S. S. White Dental Manufacturing Company, Broadway and Ninth street. Dr. Sidney S. Stowell, of Pittsfield, Mass., inserted in the mouth of a patient a crown and extension crown, consisting of the superior left first and second bicuspids, the piece being supported by the root of the first bicuspid, and anchored by means of a gold bar into a slot cut in a large gold filling in the anterior approximal surface of the first molar. (See illustration.) The crown was after Dr. Stowell's method illustrated and described in the DENTAL COSMOS for October, 1887, and also in Evans's recent volume on Crown- and Bridge-Work. The extension was in accordance with the same idea, that of using Logan crowns, backed up with gold after his method, which consists in cutting off the pin, grinding the tooth into position, investing, and then fusing a quantity of pure gold onto the stump of the pin, and while in a fluid state spatting it down with a steel spatula, no borax being used. In this manner a *perfectly tight*-fitting backing is obtained. The tooth was then soldered to the single crown. The piece when completed presented an appearance artistically true to nature, there being no gold in sight. It was strong and practical withal, as the teeth and material used were such as are furnished by the trade, and can be obtained by all. The work can be done by anyone skillful in crown-work with only a blow-pipe and such tools as are commonly used for that work. The natural appearance obtained by the use of all-porcelain crowns was a marked and pleasing feature of the operation, as was also the method of first inserting the gold filling which was to support the anchorage bar and afterward cutting the slot. In this way the



vibration of the piece caused by mastication would have no tendency to loosen the filling. Vibration taking place in the slot gold upon gold, no harm would result. Dr. Stowell claims that extensive bridges can in like manner be constructed. . . . Dr. H. H. Sisson, of New York City, demonstrated the advantages of his improved disk-carrier. The disk is carried in a shield of nickeled brass, which, while it pushes the dam out of the way, prevents at the same time any tearing of the dam. The shield is so arranged that the disk can be carried perfectly straight or be made concave or convex, thus enabling the operator to give the filling any desired contour. Dr. Sisson also exhibited a laboratory gas regulator, an ingenious contrivance for saving gas. . . . Dr. A. L. Stern, of Berlin, exhibited in his own mouth a skeleton partial lower plate made by C. M. Richmond, and designated by the maker as a movable bridge. As a plate it was a very successful piece of work, but if to be kept in the mouth without frequent daily removals, as was evidently the intention of Dr. Stern, it would soon become a very offensive article on account of the impossibility of keeping it clean in the mouth. . . . Dr. J. P. Carmichael, of Milwaukee, Wis., exhibited a very neat invention of a labor-saving article in the shape of a mouth-disk moistener, which the operator can hold in his left hand while manipulating the engine hand-piece with the right. It consists of a hollow metal handle with an attachment at the end similar to a mouth-mirror, only in place of the mirror there is a small piece of sponge. The other end of the handle is connected by means of rubber tubing with a rubber ball filled with water. By slight compression of the ball the sponge is kept continually moist. . . . Dr. A. J. Reinhold, of New York City, presented a girl of the age of twelve, showing a congenital deformity consisting of a very bad mal-occlusion, the inferior maxilla protruding a very considerable distance. He was advised to try the effect of constant pressure directed against the inferior maxilla to see if it was possible to bring the maxilla in its proper line in this manner. . . . Dr. J. C. Dixon, of Montreal, Canada, exhibited an improved rubber flask doing away with all bolts and screws. The various parts are securely held in position by a heavy brass spiral spring. . . . Dr. C. C. Carroll, of New York City, exhibited his aluminum cast dentures, showing a movable bridge in his own mouth constructed in accordance with his method. It was doing good service and was much more cleanly, and consequently the mouth on that side was in a more healthy condition than the other side, where was fastened a similar extent of bridging done in gold but encumbered by the presence of the so-called cleansing spaces, which would be much better named refuse receptacles.

Incidents of Office Practice.

Dr. Northrop. By request of some members I have brought a few casts. The one which I will first pass around is a case where after the extraction of a lower central incisor there was found to be the difficulty of getting the upper front teeth to antagonize with the lower front, owing—as you will see by the model—to the lower teeth impinging on the mucous membrane of the palate two or three lines back of the incisors. The best and easiest way that appeared to me to bring the front teeth back into line was to elongate the teeth by opening the bite. In order to do this I had two gold caps made for the lower sixth-year molars, with the result as you see.

The last case is of a young lady having one of those beautiful V-shaped arches. Before I commenced to operate on this case I

Fig. 1.

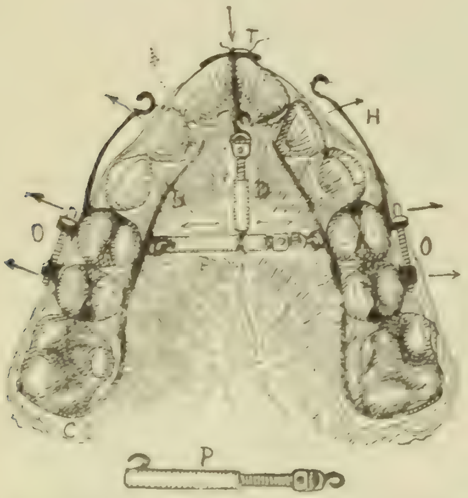
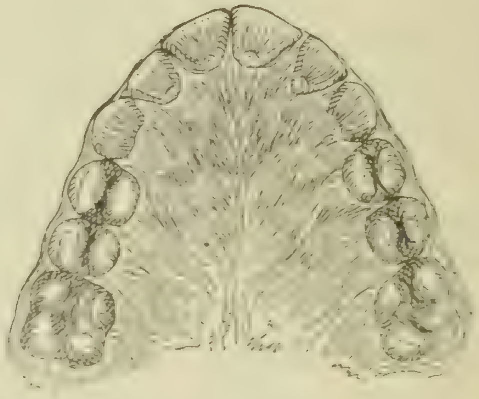


Fig. 2



O, O, Anchor bands; *P,* Transverse jack-screw; *D,* Draw-jack; *H,* Wire arms; *B,* Bars; *I,* Tee-piece. Arrows indicate direction of movements of the teeth. A rubber ring was caught on the hooks at end of arms *H* at a later stage.

asked the advice and opinion of a good many dentists, and I was advised by most of them to make a plate and put in wedges. You will notice that the teeth are exceedingly short in their development. I tried to spread that arch by the use of a plate and wedges, but the teeth, as I have already stated, were so short, and the plane of one side was so much higher than that on the other, that it was impossible to retain the plate in place. I tried ligatures on the sixth-year molar, tying around the bicuspids; but they caused so much irritation that I abandoned them. As a last resort I called upon Dr. Farrar and asked him if he could not help me out. The fixture I now show you, and with which the desired result was accomplished, was made by the suggestion of Dr. Farrar. (Fig. 1.) I fastened it in the mouth about the 10th of March and took it out about the 25th of May. The constant antagonizing of the lower teeth against the upper caused the lower arch to expand in unison, so that now the articulation and arches are quite perfect. (Fig. 2.)

Dr. V. H. Jackson. Mr. President and Gentlemen: On the 15th of September I examined a patient suffering with violent neuralgia, —a lady, aged about thirty-five, somewhat anemic in appearance and with a neuralgic diathesis. From a history of the family it was found that other members had suffered with neuralgia. The paroxysm came on daily, but with no regularity as to the hour, and lasting from three to ten hours. On examination of the mouth I found it affected with pyorrhea alveolaris. I advised her to go under treatment immediately, and suggested the extraction of two of the teeth, which were very loose, a molar and a bicuspid (a bicuspid between being quite firm); but she would not at that time submit to the extraction. I scaled the teeth and treated the gums with iodine. About an hour after treatment the pain ceased, and did not return until the following day, when she sent for me to render further relief. I prescribed antifebrin in eight-grain capsules. After taking two of the capsules the pain ceased within two hours. She had no return of the trouble, and on the 19th called and requested me to go on with the treatment of the gums. I worked for probably half an hour upon the teeth adjacent to the affected ones, and treated the inflamed parts with iodine and recommended Listerine as a mouth-wash. An instrument could be passed over the end of the palatal root of the molar. That evening I was called and found my patient suffering again with severe paroxysms of neuralgia. She had taken one capsule of antifebrin before I arrived. I then gave her two of Moussette's pills, a remedy I was anxious to learn the value of. The pain ceased soon, but I was not fully convinced of the efficiency of the remedy. The trouble did not return until the evening of the 24th of September, when she had another paroxysm. As it was necessary the patient should have rest, morphine was administered with success. On the 25th the patient consented to have the molar taken out, since which time there has been no return of the pain. There was not much hemorrhage after extracting, but on the 28th the patient was attacked, while on a shopping expedition, with quite a severe secondary hemorrhage, which had continued nearly an hour when she reached me, but was controlled in about fifteen minutes by the use of tannic acid on a moist pledget of cotton, which was wedged into the socket, and the patient was directed in case the hemorrhage returned to make a bandage of cloth about one inch wide and roll to the diameter of about three-fourths of an inch and place lengthwise between the jaws and against the opening. The pulp in the palatal root of the molar was found dead.

Moussette's pills are composed of one-fifth milligramme of aconite and five centigrammes of quinine. They are put up in Paris, where

they are highly recommended for neuralgia. Of the efficiency of aconite in neuralgia I have no doubt, and I have had good results from the use of quinine where the tendency to recurrence of pain is at regular intervals.

I have attained the best results with antifebrin where there is a tendency to inflammation.

Dr. Atkinson, who had been announced to read a paper on the "History of the First District Dental Society," had not been able to prepare it, owing to sickness in his family. He, however, addressed the society on that subject, and will at a future meeting read his paper as promised.

Adjourned.

B. C. Nash, D.D.S., *Secretary.*

UNION CONVENTION OF THE FIFTH, SIXTH, SEVENTH, AND EIGHTH DISTRICT DENTAL SOCIETIES OF THE STATE OF NEW YORK.

A union convention of the Fifth, Sixth, Seventh, and Eighth District Dental Societies of the State of New York, was held at Syracuse, commencing Wednesday, October 24, 1888. The sessions were held in the auditorium of the Leland Hotel. There was a large attendance of the members of the societies named, and many visiting dentists also were present. An excellent programme, including papers and discussions on many subjects often omitted from the consideration of dental societies, was presented, and the meeting was highly creditable to those who projected and carried it out. Drs. G. L. Curtis and S. B. Palmer, who bore the brunt of the work of preparation, and their coadjutors, may well be proud of the result of their efforts. At the banquet, which was served in the dining-room of the hotel, one hundred and seventy-five persons sat down. To add to the social enjoyments of the gathering, dentists from out the city were specially requested to bring their wives, for whose entertainment a ladies' reception committee was organized, the members of which were indefatigable in ministering to the comfort of their guests. From whatever stand-point the convention is viewed, it must be regarded as a memorable gathering.

First Day—*Afternoon Session.*

The meeting was called to order at 2.45 P.M., by Dr. B. T. Mason, of Phœnix, president of the Fifth District Society, who after prayer by Rev. George B. Spalding, D.D., read his address of welcome, in

which he enlarged on the advantages which had accrued to dentistry from associated effort.

Dr. W. C. Barrett, Buffalo, in his reply on behalf of the guests, referred briefly to the history of the union conventions of the district societies of the western part of the State, which, originally confined to the two districts in the extreme west, had been found so profitable that they had been extended till they included the two districts next toward the east. Concluding, Dr. Barrett said, "I assure you, Mr. President, that we come with pleasure, we will accept with thanks whatever you have to give us, and we hope some time to return your hospitality, even if we do not come up to the high plane which you have assumed."

After the transaction of the usual routine business, the presidents of the visiting societies were invited to take seats on the platform.

Dr. E. D. Downs, Owego, president of the Sixth District Society, announced that he had been instructed by his society to invite the members of the convention to meet with them next year, the time and place to be determined hereafter. The invitation was accepted.

The privileges of the floor were extended to all dentists in good standing and to physicians in attendance on the meeting.

Dr. I. C. Curtis, Fulton, read a paper entitled "Chemistry an Important Feature in Dental Education."

After touching upon the desirability to all, of whatever class, of a knowledge of chemistry, and the special need of such knowledge to dentists, Dr. Curtis stated the purpose of his paper to present some of the changes occurring in the mouth which result in the disintegration of tooth-structure, and to point out some of the practical means for combating it. Assuming that all decay of teeth is due to external influences, the substances brought in contact with them as food or medicine, or those resulting from the decomposition of one or both, are to be considered. If a portion of a sour apple or lemon or some dilute acid is taken into the mouth the teeth become what is termed "set on edge," which means that a small portion of the calcium of the teeth has been acted upon by the acid, forming a new compound and leaving the organic part unprotected. From the decomposition of starchy foods results acetic acid, and from this by further fermentation butyric acid. Nitrogenous substances, as lean meats, albumen, and mucus, are converted by decomposition into acids of the nitric and nitrous groups. The normal fluid of the stomach contains hydrochloric acid, and in many cases of dyspepsia butyric acid is found, while nitric, sulphuric, sulphurous, nitro-hydrochloric, and hydrochloric acids are in common use as medicines, either alone or in combination. Of the organic

acids we have, in apples malic acid; in plums, prunes, grapes, and currants, tartaric acid; in lemons, citric acid. Any acid which has a stronger affinity for calcium than orthophosphoric acid will decompose tooth-structure. . . . According to Roscoe and Schorlemmer, "The normal orthophosphates, while insoluble in water, are easily soluble in dilute acids, by which means they are converted into soluble hydrogen orthophosphates." Assuming that phosphoric acid has less affinity for calcium than the other acids named, Dr. Curtis showed by formulæ the results of placing tooth-structure (calcium orthophosphate) in dilute nitric, nitrous, sulphuric, sulphurous, hydrochloric, hydrobromic, hydriodic, orthophosphoric, lactic, butyric, acetic, tartaric, malic, citric, and formic acids.

Whenever lean meats are habitually allowed to remain between teeth, decay almost invariably ensues, which is explained by the authorities before quoted as follows: "When nitrogenous organic matter is exposed to the air, the nitrogen assumes the form of ammonia; but when alkalies, such as potash, soda, or lime, are present, a further slow oxidation takes place, and nitrates of these metals are formed." In combating the action of acids upon tooth-structure, it is to be borne in mind that an acid is always unsatisfied until it is combined with a base to produce a salt, so that if instead of permitting the salt to be formed at the expense of the tooth-structure the base is supplied from outside, the problem is solved. Happily potassium, sodium, and magnesium have more affinity for acids than calcium. It is well established that an approximally decayed tooth, though never so well filled, will continue to decay if subjected to the same influences as before it was treated. The conditions are changed in a measure by self-cleansing spaces, by contouring, or by the removal of one or more teeth; but whatever means are employed reliance is still placed on the saliva, because first it acts mechanically in conjunction with the tongue, and second it is alkaline, and will neutralize acids with which it comes in contact. The teeth of smokers who take care of them are better preserved than those of non-smokers, because the salivary glands are stimulated to the production of an abnormal quantity of saliva, and because a certain amount of creasote comes into the mouth with the smoke to retard fermentative action. Decay cannot occur in the presence of an alkali. A more thorough use of alkaline earths, as a mouth-wash or to be left in the interstices of the teeth, should be recommended. Chalk (calcium oxide combined with carbon dioxide) readily gives up its alkaline earth to any of the acids usually found in the mouth, and being free from unpleasant taste can well be recommended as an antacid. Magnesium carbonate can be used in like manner, and potassium carbonate or bicarbonate, sodium carbonate or bicar-

bonate, can be used in mouth-washes. It may be well to leave ammonia out of the list, because under certain conditions it will form nitric acid.

The dentist of the past has combated caries with manipulative skill. It remains for the dentist of the future to add a thorough knowledge of chemistry, relying on self-cleansing spaces, antiseptics, and alkaline washes.

Dr. Barrett had listened with pleasure to the admirable presentation which had been made of the theories of a few years since. The correctness of the merely chemical ideas given cannot be gainsaid, but they follow the lines laid down several years ago, and ignore much that has since been brought to light. While we must know that the reactions described take place when the conditions are favorable, yet it must be remembered that in the mouth we find these acids so diluted that the reactions do not occur. For instance, citric acid may produce the reaction noted, but the malic acid found in an apple is not strong enough to act on the enamel; hence it is not necessary to take an alkaline corrective every time one eats an apple. Great changes have occurred within a comparatively brief period in the domain of chemistry. The changes in the nomenclature alone have been so complete as to require almost special study to keep pace with them, while the advances in knowledge have been equally marked. Within a few years a great change has taken place in the knowledge of fermentation which we possess. We used to talk of catalysis, but that question has been solved by the knowledge we now have of the fermentative organisms. Dr. Miller has demonstrated that they produce acids, and that these are the cause of caries. It is the bounden duty of every dentist to understand thoroughly this subject of fermentation, which in the opinion of the speaker lies at the very foundation of all dental chemistry.

Dr. W. H. Dwinelle, New York. Dr. Barrett has struck the keynote of this most interesting subject. Fermentation will account for much of the phenomena of caries which chemistry will not account for. He recognizes the changes in the nomenclature, and he recognizes further that behind the chemistry that is known there is a hidden chemistry which we do not understand. If we did we could by analysis discover the elements which give certain substances found in nature their powers, and by synthesis reconstruct them, which we cannot do. Thus, in the analysis of spring water, some waters are found to contain no mineral elements of any degree, yet their potency is beyond question. We must admit that we have not learned all of chemistry. "There are many things in heaven and earth, Horatio, not dreamed of in your philosophy." He wished to take issue with the assertion of the paper that, after we

have done all in our power to place the teeth in good condition, if the patient is subjected to the same influences as before the teeth were filled, decay is as likely to occur as before. This would, as the boy says, give a black eye to all dentistry. He does not consider, when he has got through with filling the teeth of a patient, that he has very materially changed his habits or his method of living, but he does not expect to see decay recur as a rule.

Dr. Truman W. Brophy, Chicago, would take issue with the statement of the paper that decay does not occur in alkaline conditions of the saliva. Some of the most extensive cases of decay are found in mouths that are always alkaline. This is accounted for by the fact that lactic acid produced through the agency of fermentation is the most important factor in decay. Mouths are found with the stringy saliva which accompanies the alkaline condition, and yet in which decay is observed all along the gum-margins. This has been verified so often that there is no doubt of it. He does not believe that the milder vegetable acids have any appreciable effect on tooth-substance. On the contrary, he thinks that alone they would never break down the teeth. He is one of those who believe that the microbes are the agents which cause decay.

Dr. J. Branston Willmott, Toronto, Canada, was pleased with the paper, and while taking exception to some of the ideas put forth, it must be understood that his criticisms are not made in a captious spirit. He has before taken exception to the explanation of the phenomenon of "setting the teeth on edge" as given in the paper. He thinks that it is a hyperesthetic condition caused by the acids permeating the enamel and acting as an irritant to the underlying dentine, the condition passing away as soon as the acids are washed out. Neither can he accept the idea that acids which are innocuous to the soft tissues can destroy well-developed tooth-tissue. He thinks that it is only those acids which are formed in the mouth in actual contact with the teeth that act upon them, and that they act only when in the nascent condition; and that those acids which are taken into the mouth in fruits, etc., have no destructive action upon the tissues with which they are brought into contact. It has been pretty well established that the exciting cause of caries in the teeth is fermentative action, and that recurrence of caries after filling may be better prevented by the use of germicides and antiseptic dentifrices than by the use of antacids as suggested by the paper. There is a large field here for hygienic treatment.

Dr. I. C. Curtis believes that there is no action on the enamel of the teeth which we can perceive, that is not the effect of a cause. It is not necessary to have extensive action to make it perceptible on so sensitive an organ as the human tooth. There is a question which

has not been finally determined as to whether the bacteria found in the presence of decay are its cause or an effect of it, though it is ascertained that whatever will destroy the bacteria will prevent the effect. Whatever it is that attacks the tooth-structure, it lacks something which it apparently finds in the tooth; hence its action upon it, which is sometimes rapid, sometimes so slow that it may be years in producing the effect. In the cases referred to by Dr. Brophy where decay is found in alkaline mouths, there is a line which corresponds exactly with the location of the decay, where tests with litmus show that there are acids. He believes in the use of antiseptics,—in those things which prevent fermentation,—because they stop the formation of acids. With reference to the remark by Dr. Dwinelle, he would like to know how we can expect to make the teeth better than the Creator did. Most of us, when we treat and fill a tooth, do change the conditions. We may not change the patient's way of living, but we do change the environment of the tooth; but when we attempt to improve upon the Creator we fail ingloriously.

Dr. Dwinelle. That is why we are dentists,—to remedy the defects of humanity so far as the masticatory apparatus is concerned. From many causes there is much defect of structure in the teeth, and we are here to correct them. That is the object of all science. Man would soon wear out in many ways if it were not for art. If it were true that the dentist, in the treatment of decaying teeth, did not succeed in placing them in better condition than when they became decayed, then dentistry is a failure. He would say, for the credit of dentistry at large, not as a boast, in the light of his own experience, which has been larger than that of many of those present because he has been longer in the profession, that he knows of teeth which he filled thirty-five years ago—teeth then in the most dilapidated condition—which he would affirm are as perfect to-day as the day they were filled. What one man has done others can do. If the same causes exist after the teeth are filled as before, then decay will go on just the same. We think we have accounted for all the causes of failure when we have given a formula for treatment, but decay may go on. We are trying to solve these enormous problems of nature, and we are going on to success, though every now and then we do meet with a failure. If it is a fact that every time an acid comes into contact with enamel a portion of it is wasted, we will have to stop eating fruits and live upon alkaline foods. But he apprehends that the influence of fruits is so quickly compensated that no harm is done.

Dr. John S. Marshall, Chicago, wished simply to corroborate one of Dr. Dwinelle's remarks. While engaged in practice here in

Syracuse he had seen teeth which had been filled by Dr. Dwinelle forty years ago that were in just as good condition as when the fillings were inserted. He had also seen examples of the same sort from Dr. Westcott and Dr. Allport. He had always considered these three men the fathers of modern dentistry.

Dr. E. T. Darby, Philadelphia. There seems to be a difference of opinion among those who have spoken, and doubtless much of this arises from the fact that they are reasoning from different stand-points. It was in this city of Syracuse that the late Dr. Westcott conducted his experiments showing the action of acids upon tooth-structure. He found that all mineral and vegetable acids acted readily upon tooth-enamel, and that acids need not be of any considerable strength to decalcify teeth. Even one part in one hundred was sufficient in most cases to erode the surface. A tooth immersed in the juice of a lemon (citric acid) would soon lose its polished surface and assume a chalk-like appearance, and if left in long enough would undergo partial decalcification. Common cider vinegar (acetic acid) will erode the surface of the enamel in forty-eight hours. If you would note the action of acids upon carbonate of lime, place a little lemon-juice or strong vinegar upon a marble slab and allow it to remain twenty-four hours. The polish is first destroyed, and then a white powder may be scraped from the spot after the acid has evaporated. Dr. Brophy has spoken of the alkalinity which is shown to exist so frequently in some mouths. This may be true of some portions of the mouth. For instance, the product of the sub-maxillary, sublingual, and parotid glands may show, as they accumulate in the floor of the mouth, an alkaline reaction, but if litmus paper were put into the cavities of carious teeth or in the spaces where food has accumulated, the test would doubtless show an acid reaction.

From time immemorial there have been theories to account for caries of the teeth. Hippocrates attributed it to the humors of the body. Then came the worm hypothesis, and later the inflammatory theory, and after that the chemical and electrical. None of these have satisfied for any great length of time. The decay of the laboratory and the caries of the mouth have not been found to be the same. It has been easy enough to decalcify teeth in the laboratory, but it has remained for Dr. Miller to produce by his cultures the same conditions there that exist in the mouth.

Fermentation, then, is the great factor in producing caries of the teeth, and cleanliness, *absolute* cleanliness, about the only preventive. The surfaces of the teeth that are kept *clean* are not the seat of caries. Antiseptics and antiferments may do much to prevent decay, but tooth-picks and floss silk faithfully used after each meal will do more. Dr. Miller has found that the micro-organisms of

caries do not flourish in carbolic acid or bichloride of mercury. Neither are they in their element when in the fumes of tobacco or in a decoction of that weed. This is not mentioned, however, as an argument in favor of the ladies using tobacco.

Dr. I. C. Curtis would like to know if the microbes do the work of destruction themselves, or do they generate an acid which does it. He believes we always change the shape of a tooth when we fill it, or at least that we change the conditions which surround it, and that that is why, when the work is properly done, the decay does not recur. The surfaces are made smoother, so that they can be kept clean more readily and thus prevent fermentation from taking place. The approximal surfaces are of course the most frequent points of attack and the most difficult of preservation from decay. Whenever he is tempted to congratulate himself that he has done a specially good piece of work, he thinks of what a satire it would be on our efforts if one could see the effect produced by going into a large gathering of people and asking them to remove their artificial teeth.

The chair announced the appointment of the following committee of arrangements for the next union meeting: Sixth District Dental Society, F. B. Darby, Elmira, chairman; W. H. Hall, Binghamton; W. C. Stewart, Elmira; Fifth District Society, J. A. Schmidt, Ilion; J. E. Cummings, Syracuse; Seventh District Society, R. H. Hofheinz, J. Edward Line, Rochester; Eighth District Society, C. S. Butler, W. A. Barrows, Buffalo.

Adjourned to 7.30 P.M.

(To be continued.)

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

THE regular meeting of the Odontological Society of Pennsylvania was held at Justi's Hall, 13th and Arch streets, on Saturday evening, October 6, 1888. President Kirk in the chair.

INCIDENTS OF OFFICE PRACTICE.

Dr. Faught. A young lady of sixteen fainted, and falling against a mantel knocked out the four upper incisors. They were immediately washed and reinserted in their sockets. They grew fast, and for two or three years did good service. Then one of them gave trouble,—the right lateral,—and was removed. The left central at this time was badly decayed, and just as the dentist was giving the finishing touches to an extensive gold filling he had inserted, the whole crown broke off. The root was then extracted and the right central also taken out. A denture was then constructed bearing three teeth to fill the vacancy. When the case came into

my hands I had the last incisor removed. It had then been in service about sixteen years after replantation. She informed me that there had always been a feeling of fullness and abscesses forming and breaking every two or three weeks over the place from which the left central was extracted. She now has two fistulæ drawing pus at this point; these are recent. Two months ago she had none, and now these two have appeared. The rest of her teeth are perfectly firm and sound, and there are no movable portions of bone nor any other trouble that I can find to give rise to these abscesses. Can anyone suggest a solution of the cause?

Dr. James Truman. Did you examine for necrosis of the bone?

Dr. Faught. Yes, I examined both for necrosis and for caries. I do not think there can be any necrosis, though there may be caries.

Dr. Boice. I had a case in which I extracted the central and lateral about a year after the same trouble as Dr. Faught described. In this case there were openings before the teeth were removed, and I do not think the old sacs had ever been broken up. Probably it is the same in Dr. Faught's case.

Dr. Sudduth. In such cases I would cut through the gum and bur out the bone about the abscess-cavity. This would be likely to effect a cure whether the case was one of necrosis or caries of the bone.

Dr. Kirk. I have had three or four cases of this kind within the past year. I treat them the same as I would a case of a denuded apex of the root: I open up the region and bur away the affected part. I operated on two yesterday. My method is to take a hypodermic syringe with the end of the point broken off and inject a very small portion of cocaïne, a part of a drop only; this enables me to cut into the part with the lancet till I reach the opening of the root. I then take a bur and cut off the apex of the root. Whether it be necrosed bone or diseased membrane about the apex of an old root, the same treatment maintains.

Another case of mine had a fistula from which ran a thin white glairy fluid and not pus. I have asked several dentists if a cyst of this kind could be organized from a pyogenic membrane. This case was a girl who came to me with a swelling about half the size of a pigeon's egg, which when opened was found to be filled with such fluid as I described, thin and glairy. The tooth had been filled. I removed the filling and passed a probe through the tooth, and found there was a cyst. I then etherized the patient, removed the cyst, and treated the wound with iodine, and it made a good recovery. In such cases the knife and the bur are needed, and will usually effect a cure.

Dr. Bennett. Immediate root-filling has been the favorite theme for some time, and within certain limits is a safe procedure, but I

regard the immediate extirpation of abscesses as more certain and satisfactory. This, as we all know, is not new, yet some seem to think it too heroic for the usual mode of treatment. It is needless to say that this is a mistaken estimate. It consists in cutting out the diseased tract with that very useful group of revolving blades called a stoned bur, and syringing the parts with some good disinfectant. A dentist leaving town left a case in my hands of an obstinate abscess that had given much trouble and had resisted treatment for a long time. The tooth was a first bicuspid, and the opening was through the palate. After applying cocaïne I passed a round bur in the right angle attachment into the abscess, and then used a fissure-bur along the fistulous opening. I next syringed out the wound with the usual solution of bichloride of mercury (one grain to two ounces of water), and in a few days the parts were entirely healed.

Another case, also a first bicuspid, came into my hands,—a case similar to the one described by Dr. Kirk. The abscess had no opening, merely a decided bulging of the process, which has more than once been mistaken for a long tumor. The canals had been but partially cleaned, and were filled with what had once been cotton, the cavity being stopped with gutta-percha. I absorbed the contents of the canals, and after applying hot air I gradually worked a Brewer drill up close to the apical foramen. I filled temporarily with cotton saturated with a strong solution of bichloride (one grain to an ounce) and deodorized iodoform. Two weeks later, the abscess having entirely disappeared, I filled the canals permanently with oxychloride of zinc, and finished with gold at the same sitting.

Dr. James Truman. It appears to me that Dr. Faught's case is simply necrosis of the alveolar plate. After the extraction of a tooth, the inflammation at times extends and persists until it ends in partial necrosis. I have not had the same success in burring out these cases as Dr. Kirk seems to have had, and I have but little faith in the use of instruments in the removal of necrosed bone. It is in my judgment better to wait until the sequestrum is thrown off by natural processes.

Dr. Sudduth. In regard to the point raised by Prof. Truman, I fully coincide with his views. In abscessed teeth we have an appearance of a sac, but there is no membrane which secretes pus. It is formed by the disintegration of tissue which has lost its vitality, or by the direct exudation of white blood-corpuscles. The question asked by Dr. Kirk whether a cyst could be formed from a preexisting abscess would require a careful examination to answer, but I would say not.

Dr. Tees. In the case of an abscess, if the pyogenic sac does not secrete the pus, how is the pus formed?

Dr. Sudduth. There can be no question that pus is formed by the retrograde metamorphosis of tissues consequent upon the loss of the pabulum upon which the cells live. I am not quite sure whether it can be formed without the presence of micro-organisms. This is still an open question. When you remove the sac, you remove a foreign substance which is the cause of the trouble. The inflammation consequent upon the operation will stimulate the surrounding tissues to overcome the effects of the irritant.

Dr. Faught. I had a case of a lady who came to me with trouble in her left upper lateral, apparently suffering with an acute abscess. Supposing that the tooth contained a devitalized pulp, I told her that I should soon have her in a comfortable condition. Upon examination, however, I found that the pulp was alive, and by close questioning I found that the trouble arose from her habit of biting off threads. I treated the abscess, but cannot get it to heal. I can reduce the inflammation, but cannot prevent its recurrence. The tooth is quite loose.

I have the case of a gentleman who has sound teeth, only a single cavity in a second molar filled with gold. He came complaining that he could not eat without great discomfort from pain between the first and second upper molars on each side. He had applied to one dentist who packed cotton and sandarac between the teeth, and this gave him temporary relief or seemed to. But this of course could not be permanent. As that dentist did not know of anything else to do, the patient went to another, who thought it would help him to separate the teeth, which he did with the effect of increasing the evil. I examined the case very carefully and failed to find any cause for the trouble, and was about to tell him that I would have to see him again before I could tell him what I could do, when I ventured to ask him if he had ever had any nasal trouble. He told me he had some catarrh. I was convinced, as the trouble was on both sides of the mouth and in these particular teeth, that the catarrh was the cause of his suffering, and advised him to have it treated. I have not heard from him since, but believe he will be relieved if the catarrh is cured.

There is still another condition I would like to report for discussion. I had a girl of thirteen under my care whose teeth were fully up to the average, only having a few cavities filled. She went away one summer, and when she returned I found that the enamel on the cervical borders of her teeth was completely disintegrated. It was as white and as soft as chalk. I was at a loss to know what the best course was to pursue, but finally took sharp burs and trimmed it all away and polished her teeth and let her go. I do not know whether this treatment proved curative or what was its effect, for

she did not return, as I lost the whole family shortly after on account of fees. Now I have a similar case,—a lady of twenty-three. This lady is of a nervous temperament and has suffered very much. The conditions are very similar. I am holding the case under consideration and would like to hear an expression of opinion.

Dr. James Truman. These are simply cases of erosion, nothing more. The secretions of the mouth are acid and are destroying, or have already destroyed, the enamel. I certainly would not care to use the bur on such teeth, but would prefer less energetic treatment. An alkaline wash connected with general toning up of the system is the course to be pursued. This destruction is carried on mainly at night; this I demonstrated long ago was the period of greatest destruction. The dryness of the mouth at that time, caused by the general subsidence of the salivary secretion, invites this process of fermentation and an increased quantity of acid products. This I have demonstrated by testing the secretions of the mouth at this period, and the marked acid response has been conclusive of the correctness of this view. At that particular locality the danger of erosion is greatly increased. Dr. Kirk has shown that the glands of the mucous membrane covering the lips secrete at all times an acid; this in the day hours may not be injurious, from the constant dilution by the alkaline saliva; but at night there is nothing to counteract its influence. Between thirteen and twenty is the age when these destructive influences are the greatest and the most rapid in their work.

My plan of treatment is lime-water as a wash, and chalk made into a paste and applied on the teeth at night and allowed to remain there. This has stopped all action when persistently applied.

Dr. Faught. I consider that the condition is indeed a serious one, and want to know if there is anything further to be done. I have placed the patient on the chalk treatment, but want to know about burring away the disintegrated enamel and polishing the dentine.

Dr. James Truman. I would not do any cutting; polishing with stick and pumice or chalk should be the extent of efforts at removal of softened tissue.

Dr. Kirk. This acid action is called erosion by Dr. Truman because it leaves the surface rough. The reason it leaves the surface rough is because the teeth of children are softer than good teeth in adults; the same acid will eat a soft tooth more quickly, and therefore the surface will be left rough, while acting more slowly on a harder tooth it will be left smooth. The same phenomenon can be shown by exposing glass to the action of fluoric acid: if the acid is strong the glass will be rough, if it is weak the surface will be left smooth.

AMBLER TEES, D.D.S., *Recording Secretary.*

ANNIVERSARY MEETING OF THE ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

The programme of exercises of the Tenth Anniversary Meeting of the Odontological Society of Pennsylvania has been arranged as follows:

The meeting will be called to order by the president, at 2 o'clock P.M., on Wednesday, December 12, 1888, at Association Hall, corner of Fifteenth and Chestnut streets.

Opening Prayer, by Rev. Wayland Hoyt, D.D., Philadelphia.
Introductory Address, by Prof. Chas. J. Essig, D.D.S., Philadelphia.
Response, by A. L. Northrop, D.D.S., New York.
Paper—"Etiology of Dental Caries," by Geo. S. Allan, D.D.S., New York.
Discussion of Dr. Allan's paper.

December 12, *Evening Session*, 8 *o'clock.*

Lantern exhibit.—Dental Histology and Pathology. Drs. G. S. Allan, New York, W. Xavier Sudduth, Philadelphia, and R. R. Andrews, Cambridge, Mass.
Discussion.

Thursday, *December* 13, 9 A.M. *to* 1 P.M.

Clinics as follows:

Dr. Edwin P. Wright, Richmond, Va. Bleaching teeth by his method, demonstrating the use of his special bleaching apparatus.

Dr. W. Storer How, Philadelphia. "Porcelain inlays."

Dr. H. A. Parr, New York. Removable bridge-work.

Dr. E. T. Starr, Philadelphia. Electrics.

Dr. W. G. A. Bonwill, Philadelphia, will exhibit his "Correctors" of irregularities, with remarks upon and demonstration of his system.

Dr. T. S. Waters, Baltimore, Md. Removable bridge-work.

Dr. H. C. Register, Philadelphia. Subject to be announced.

Dr. H. W. F. Büttner, Baltimore, Md., will demonstrate his method of mounting crowns and removable bridge-work.

Dr. A. G. Bennett, Philadelphia. Subject to be announced.

Dr. J. A. Woodward, Philadelphia, will exhibit his mouth-illuminating apparatus for dark days.

A number of other gentlemen will also give clinical demonstrations.

Thursday, *December* 13, 2 P.M.

Prof. James Truman, D.D.S., Philadelphia. Paper—"Treatment and Filling of Root-Canals."

Dr. Safford G. Perry, New York. Paper—"The Treatment of Approximal Surfaces."

Prof. S. H. Guilford, Philadelphia. Paper—"Voluntary Tooth-Movement resulting in Abnormal Interdental Spaces."

Dr. T. S. Waters, Baltimore, Md. Paper—"Removable Bridge-work."

Adjournment.

A manufacturers' and dealers' exhibit of novelties pertaining to dentistry will be made during the sessions in the rooms adjoining the clinic rooms.

The Colonnade Hotel, corner Chestnut and Fifteenth streets, has been selected as headquarters for those attending the meeting. A considerable reduction in rates has been made to those in attendance.

A cordial invitation is hereby extended to the dental profession at large to attend the meetings and take part in the discussion of papers.

L. Ashley Faught, D.D.S., *Chairman*,
Daniel Neall McQuillen, *Secretary*,
For the Anniversary Committee.

EDITORIAL.

PROGRESS IN PROSTHETIC DENTISTRY.

An incidental but most important advantage to dentistry accompanying the revival of gold-crown and bridge-work, is the requirement of increased manipulative and artistic skill on the part of the operator. The character of a large proportion of the vulcanite work of the last few years has a sulphurous odor about it suggestive of the adage, *facilis est descensus Averni*. To such a facile method of constructing artificial dentures is due the advent of a class of dentists who have "picked up the business" in a few months of untutored experiment. To clumsy, disfiguring dentures, so bulky as to impair speech, and so incompletely finished as to occasion sore mouths, have been chargeable in great degree the discomforts and diseases attributed to the vulcanite base.

The increasing demand for dentures on gold bases must of necessity raise the standard of qualification for dental practice. For the promotion of this most desirable end the dental society clinics, increasing as they are alike in frequency and in interest, have become potent factors.

At many society gatherings there are now not only exhibited, but constructed and inserted on the spot, in the presence of intelligent and eager observers, gold and porcelain crowns and dentures which exemplify in the most practical way an expertness in constructive and manipulative ability worthy of enthusiastic commendation. The artistic work, admirable adaptation, and practical efficiency of these structures bear testimony not alone to the proficiency but to the professional generosity of the clinicians who so unselfishly devote their time to these instructive object-lessons. There is justification for great hopes of an increasingly honorable future for prosthetic dentistry under the elevating stimulus of these liberal and skillful exemplars.

DR. DEAN'S PAPER ON DENTAL LEGISLATION.

The leading article in the current number, on "Dental Legislation," was received from the author several months since, but writer and editor agreed that its earlier publication might be construed as having reference to political issues then pending. With the apparent political bias of the writer of the article we of course have no concern any more than with the opinions of other contributors, whose views on their several topics we do not indorse by the publication of their papers. In this instance the incidental introduction of matter not *per se* open to elucidation in this journal is yet so pertinent to his argument that we could not exclude it without detracting from what we deem an able discussion of the topic.

BIBLIOGRAPHICAL.

Hygiene of the Nursery. By Louis Starr, M.D., Clinical Professor of Diseases of Children in the Hospital of the University of Pennsylvania, etc. With 21 illustrations. Small octavo, 205 pp. and index. Philadelphia: P. Blakiston, Son & Co., 1888. Price, cloth, $1.50.

The hygiene of the nursery—more important than therapeutics—is here considered in ten chapters, embracing the features of health, the nursery, the nursemaid, clothing, exercise and amusements, sleep, bathing, food, dietary, and emergencies. But slight reference is made to drugs or medical treatment, the author's purpose being to secure the co-operation of parents in the prevention of disease,—the highest aim of scientific medicine. Intended especially for the instruction of mothers, technicalities have been carefully avoided, and the teachings are fairly within the comprehension of ordinary intelligence. The topics are treated from the stand-point of common sense, and we commend the book as an admirable condensation of hygienic rules, adapted for the good of the "little patients," to whom the volume is dedicated.

Pamphlets Received.

Transactions of the Louisiana State Dental Society, at the third annual meeting, held at New Orleans, commencing February 15, 1888. New Orleans: Lightning Book and Job Print, 1888.

Proceedings of the Twenty-fifth Annual Meeting of the New England Dental Society, held at Boston, Mass., October 5, 6, and 7, 1887. With phototype portraits of its members. Lowell, Mass.: Citizen Newspaper Co., 1888.

PUBLISHER'S NOTICE.

THE DENTAL COSMOS FOR 1889.

Thirty years' continuous publication of a monthly journal devoted entirely to dental subjects emphasizes facts of importance to every intelligent practitioner of dentistry. The complemental fact is no less significant that the subscription list of such a journal includes in its thousands of subscribers representatives of the profession in every civilized country in the world. The inferences from these facts should be obvious to each of the twenty-five thousand dentists who receives this number of the Dental Cosmos:

First. The publication is a permanent one. Many journals have appeared and disappeared during these thirty years.

Second. The Dental Cosmos has a circulation far exceeding that of any other dental journal,—probably five to one of that which stands next highest in circulation.

Third. Contributors to the literature of the profession have a legitimate desire that their contributions shall have not only a permanent record, but a wide dissemination.

Fourth. That three hundred and nearly three score monthly issues have appeared, each and all under the supervision of the present editor,—the last seventeen volumes under his exclusive direction,—is a guarantee that the literary and professional standard of the Dental Cosmos will be maintained under his continued control.

Fifth. The thirty volumes of the Dental Cosmos form a library of theoretical and practical dentistry,—a library of such value that its loss would make a wide and irreparable gap in the history of dental science and art.

Sixth. In view of the untarnished record of the Cosmos in the past, of its pre-eminent prosperity in the present, and its assured continuance in the front rank for the future, we ask the co-operation of every dental practitioner in our effort to advance the profession in usefulness, in self-respect, and in public esteem, and to strengthen fraternity and mutual helpfulness among the men who have the responsibility and the destiny of the dental profession in their hands.

Subscription, $2.50 a year, in advance. Foreign postage to Universal Postal Union countries, 50 cents.

The S. S. White Dental Mfg. Co.

HINTS AND QUERIES.

To the Editor of the Dental Cosmos:

Sir,—Permit me to call the attention of your readers to the importance of the subject discussed editorially in the *British Journal of Dental Science,* of which the following is an abstract.—L. H. J.

"Pathogenic Bacteria in Human Saliva.—The competent dentist should be able to diagnosticate oral lesions of all kinds, sending the more serious sort to the surgeon or physician, yet capable of treating by medication or surgery the minor sort which come immediately within his province. He should appreciate the fact that alimentary disorders arise from imperfect insalivation, or mastication of food-materials.

"Modern bacteriology furthermore claims his attention. The heat, moisture, and albuminous or saccharine matter constantly present in the mouth constitute it a 'cultivation chamber' for micro-organisms, including such as are characteristic of dental diseases. Netter has found in the saliva of nominally healthy persons a bacillus closely resembling if not identical with the Streptococcus pyogenes of Rosenbach, a micro-organism associated with if not the cause of suppurative inflammation. When it is remembered that many dental operations not only open lymph-channels which are absorbent media, but lay open bone-cavities also, Netter's results assume even greater importance than might at first appear. There can be little doubt that many reported cases of pyemia following the extraction of teeth are cases in point. It seems likely that the free blood-supply of the structures contained in the oral cavity, together with the 'free drainage and irrigation' which usually obtain in superficial wounds of the gums and jaws, would account for the few casualties of that sort that result.

"Netter's discovery emphasizes the need for a free use of antiseptic mouth-washes during and after operations, and a careful cleansing of all instruments, to avoid the ever-present danger of transferring from one mouth to another the Streptococcus pyogenes or other pathogenic bacteria."

Bichloride of Mercury.—In reply to the query, "How does bichloride of mercury compare with permanganate of potash, carbolic acid, and the other antiseptic agents commonly used by dentists?"

Bichloride of mercury as a sterilizing agent is without doubt the most effective of all the antiseptics now in use.

Prof. W. D. Miller, of Berlin, in a list of remedies with which he made careful experiments, places the relative powers of well-known agents in preventing the development of fungi as follows:

Bichloride of mercury	1–100,000
Peroxide of hydrogen	1– 50,000
Iodine	1– 6,000
Iodoform	1– 5,000
Salicylic acid	1– 2,000
Eucalyptus	1– 1,600
Carbolic acid	1– 1,500
Chloride of zinc	1– 1,250
Permanganate of potash	1– 1,000
Listerine	1– 120

In the implantation of teeth and kindred operations, bichloride of mercury used as a sterilizing agent in the strength of one part of the bichloride to one thousand parts of water, is without an equal, and the proper proportions are easily obtained by using the compressed pellets of the bichloride of mercury now on the market. These pellets each contain one grain of the salt, which added to four ounces of water gives the strength of 1 to 2000 approximately.

For general use in the hands of the dental practitioner, it is doubtful whether bichloride of mercury will prove available under all conditions. As a deodorizer it is not equal to permanganate of potash. It has the disadvantage that it must be kept from contact with the metals.

Dentists are often obliged in opening teeth for the relief of abscesses, and to obtain access for remedies, to pass the drill through large gold fillings. In attempting to introduce a thread of cotton carrying the bichloride solution past the gold, the mercuric chloride would be instantly decomposed by electrolysis, the free mercury being deposited upon the filling, and by the time the fluid reached the root-canals it would in all probability be quite inert. The same objection holds in the use of bichloride of mercury as a constituent in any formula to be employed in the mouth as a sterilizing wash: contact with gold or amalgam fillings would decompose the sterilizing agent before it reached the fissures, cavities, or approximal surfaces.

Still, bichloride of mercury is a very valuable agent, and there are many devitalized teeth in which it is entirely available, and in which it would be unequaled in efficacy. For instance, in operating upon devitalized front teeth, where the fear of trouble arises more from the septic influence of the saliva which may enter the tooth by accident, or from atmospheric air, than from decomposition of organic matter, the bichloride would be preferable to permanganate of potash, as much for its promptness in preventing the development of fungi as because it is without color.—C. J. E.

A New Root-Clamp.—Previous treatment having brought the root into a proper condition for receiving a crown, and the apical portion of the root having been properly filled, a twist drill, No. 151, is used to bore out the pulp-canal to the depth of about three-eighths of an inch beyond the gum margin. A root-reamer, say No. 2, is then employed to enlarge the pulp-canal in the manner

Fig. 1.

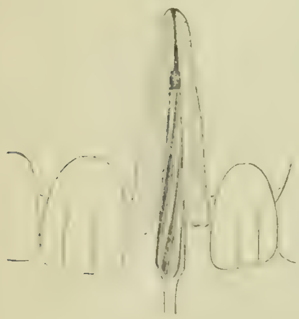


Fig. 2.

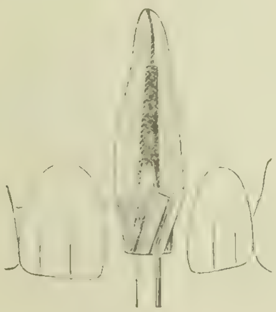
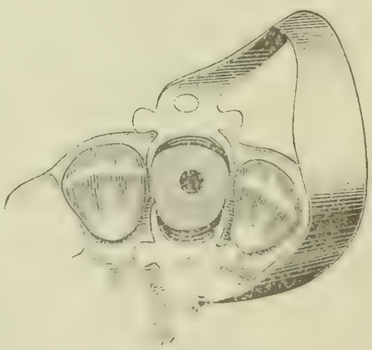


Fig. 3.



shown by Fig. 1. A root-facer, as No. 5, is then used to cut the root-end—see Fig. 2—down just beneath the gum margin. The root-clamp, Fig. 3, will fit closely the root, which, by means of its peculiarly shaped jaws, it grasps firmly under the gum, and the rubber-dam may then be stretched over the clamp and root-end. The root will thus be inclosed so that it can be thoroughly dried with

absorbent cotton or paper and jets of warm air. A Logan crown, Fig. 4, may then be ground and adjusted on the root end, and at the same time the crown post be fitted in the canal so tightly that, independently of cement, the crown will have a firm hold on the root. A very little cement or gutta-percha is, however, put on the post and in the crown recess, and the crown pushed at once close home as illustrated in Fig. 5. The rubber-dam and clamp are kept on the root after the removal of the surplus cement until the latter has become quite hard

FIG. 4.

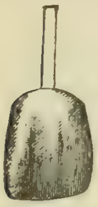


FIG 5.

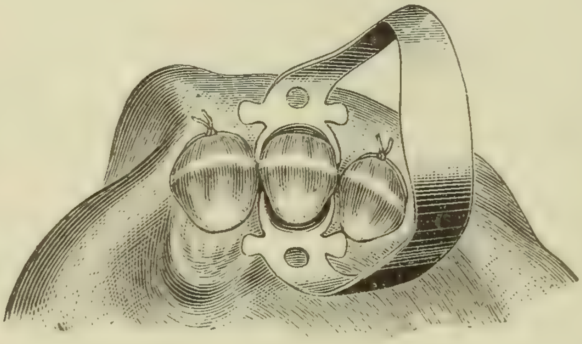
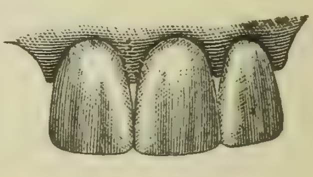
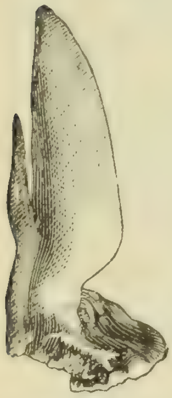


FIG. 6.



and the stability and permanence of the mounting has thus become assured. The completed operation is shown by Fig. 6. In cases where the diseased condition of the root makes it advisable to treat the root previous to setting the crown, the clamp will be found invaluable, allowing the placing of the dam, which is almost indispensable in rendering the canal aseptic.—RODRIGUES OTTOLENGUI, New York.



DENTAL ANOMALY.—The superior right central incisor shown in the illustration was extracted from the mouth of a boy thirteen years old. The jaw was badly abscessed, and the tooth had occasioned continuous pain for nearly six months. A connected history of the case was not under the circumstances obtainable, but a cursory examination developed the fact that every tooth in the mouth bore enamel markings of a peculiar puckered appearance such as may be observed by a critical examination of the illustration.—J. E. WAITT, D M.D., Boston, Mass.

TO THE EDITOR OF THE DENTAL COSMOS:

SIR,—Your October editorial states that the students of the New York College of Dentistry have formed an association for mutual improvement in dental science, and that it is the first of its kind.

The Philadelphia Dental College classes have since September 27, 1883, conducted a similar association called the "Garretsonian Society." Many papers on dental subjects have been contributed by its members, and some have been deemed worthy of publication. With the kindliest feelings for the "Students' Society" of the New York Dental College, I merely claim decided priority for ours of the "P. D. C."—OTTO E. INGLIS, Philadelphia, Pa.

THE S. S. WHITE DENTAL MFG. CO.

Inclosed find $2.50, for which please send me the "DENTAL COSMOS" for one year, commencing with January, 1889.

Name, ...

Street No. ....

Post-Office, ...

County, ...

State, ...

ON THE RELATIONS OF THE S. S. WHITE DENTAL MFG. CO. TO THE DENTAL PROFESSION.

Every successful enterprise is bound to meet with criticisms and objections. Competitors will cast slurs and sow suspicions, and although the business may be conducted on the most upright and conscientious basis, its managers must expect a certain amount of adverse comment. Samuel S. White, the founder of this house, bore his full share of this unfortunate but seemingly inevitable accompaniment of success. After he had attained to a fairly prominent position in business he was never free from detraction and unfavorable criticism. His successors have not been exempt from these, nor can they hope, under any combination of circumstances, to avoid entirely depreciation of their motives or methods. It is a satisfaction to be able to say that the detractors are few in number, and that the vast majority of those with whom the Company deals are kindly and heartily appreciative of the work which it has done and is doing to advance the honor and usefulness of legitimate dentistry.

It is the purpose of this paper to meet the criticisms that have been passed upon the Company by setting forth some of the reasons why it is of service to the dental profession, so that both sides of the case may be available to any one who chooses to inform himself upon the subject.

1st. ITS CAPITAL. The large capital of this Company is all employed legitimately in the manufacture and sale of dentists' supplies. It is invested :—

(A) In an immense plant for the conduct of its business, including machinery and tools of the most improved modern forms, without which the high standard of quality insisted on in its products would be difficult, if not impossible, of attainment.

No other establishment in the business is worthy of being named in comparison with it in this respect.

(B) In an enormous stock of porcelain teeth, dental instruments, dental furniture, and the almost unnumbered appliances required in the practice of dentistry.

This great investment represents the money value of the large and well-assorted stocks of dentists' supplies kept at its houses in five cities, whereby it is enabled to supply the daily needs of customers, to fill promptly the orders of dealers throughout the world, and thus to meet the wants of dentists everywhere as no other instrumentality does. The amount of this investment (several hundred thousand dollars) always seems at stock-taking larger than it ought to be, yet it is constantly increasing,—a condition which the rapidly expanding requirements of the profession make a necessity. In the value of the stock of goods carried it is far ahead of all rivalry, while in variety its productions exceed those of all the other manufacturers in the business combined, even crediting them with the imitations which they make of goods first brought out by this house.

(C) In credits to customers which always aggregate a large sum.

2d. ITS HIGH STANDARD OF QUALITY. While endeavoring at all times to meet the ideas of the profession as to their needs in the way of instruments and supplies, this house has never been satisfied to put goods upon the market which were not of the best quality that could be produced. It has never been in the race for "cheapness of price," and it never expects to be. It stands firmly upon the principle that *inferior goods for the use of professional men operating upon the human organism are never cheap*, and it maintains that in practically enforcing this idea it is doing the highest possible service to the dental profession. Its effort is to excel in workmanship every time. Its fine machinery and tools before alluded to, its careful system and rigid inspection at every step in the processes of manufacture,—the slightest defect being cause for rejection,—are all means to that end. Without such facilities as it has, and without such a system as it enforces, equal results are impossible. It goes without saying that no other manufacturer approaches it in the quality of its productions. It is a fact that skilled workmen, trained in its shops, cannot do as good work elsewhere, because in no other manufactory of dental goods is there so careful and rigid a system. Its prices are on some articles higher than those of other manufacturers, but its managers can conscientiously say that they give full value, and that in the long run goods made by this Company are incomparably the cheapest.

3d. ITS PROGRESSIVENESS. The dental profession has been during the past thirty years and is now wonderfully progressive, and it would have been a misfortune if its principal source of supply had pursued a timid, conservative policy. This house has always kept pace with the progress of the profession. Ever ready to adopt whatever was an improvement in material, method, or product, it has not been careful to count the cost in the loss on stock in hand, but

has promptly thrown the old into the background that the new might take its place. This has oftentimes involved sacrifices that no one outside of the establishment, and few within it, can appreciate. No house with a small business and capital could afford to do this, and yet, as has been said above, it would have been a misfortune to the dental profession if a different policy had been pursued, for in that case supply would not have kept pace with invention, and progress and improvement would have been greatly hampered. As it is, the house has not only kept fully abreast of the profession, but has very often been able to lead it by bringing forward improvements of the highest value. The history of this house is interwoven with the history of the progress of dentistry; they have moved on together and are interdependent.

A consideration of the improvements in dental appliances during the last forty years, and of the sources from whence they issued, will show what a surprisingly small fraction of them have been brought out by other manufacturers. Few of these have done original work, most of them having been busy trying to imitate what this house has developed at great cost.

4th. ITS EXPERIMENTAL CORPS. This is a part of the important business of the house of which but little is known or appreciated outside. New suggestions and devices are constantly being sent in by dentists. Many of these, although original with the senders, prove to be old ideas, and many others are quite impracticable; yet all need some consideration, and among them all are found valuable ideas that, by study, labor, and expense, are finally brought out as improvements. There is a constant endeavor to make improvements from within, and the effort requires thought, labor, and outlay. In this department are some of the ablest and most expensive men in the employ of the house, and the cost of the department exceeds the outlay for similar work of all other manufacturers in the business combined. Such a department cannot be maintained except at large cost, but it is absolutely necessary for progressive manufacturing and the continued production of a high quality of goods. The house has expended with most liberal hand for these purposes, to the great advantage of the dental profession.

If dentistry was at a standstill and its instruments, appliances, and methods fixed and unchangeable, the above arguments would not hold good, but they are unanswerable as applied to a rapidly progressive profession such as we are considering.

It needs ample capital, the most perfect manufacturing faculties, skillful experts and employees, free outlay, and a high standard of quality to keep pace with and to facilitate this progress.

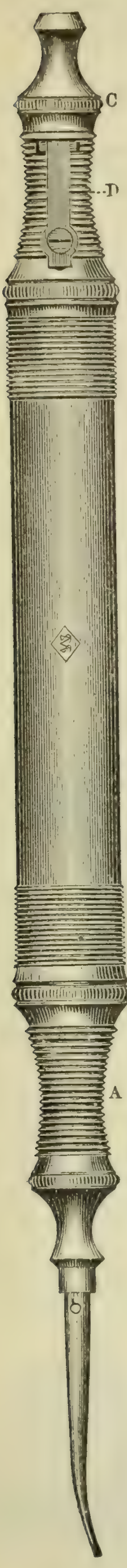
The magnitude of the house and its large capital have sometimes been referred to as grounds for supporting others. It is evident that those who have thus reasoned have not fully considered the whole subject, but have lost sight of the arguments set forth above. A little reflection must convince any unprejudiced person that twenty or fifty small houses, each having one-twentieth or one-fiftieth of the capital and business of this house, could not do nearly so much for the best interests of the profession as this one house with its great facilities has done and is doing.

It has often been said, and it is believed that candid men in the profession everywhere will assent to the assertion, that no greater calamity could befall the dental profession all over the world than that this house should cease operations and go out of business, leaving it to others to meet the wants of dentists and to carry out their progressive ideas.

No matter how large and strong this Company may be, its success and prosperity depend upon its moving forward in step with the progress of dentistry. Its interests are identical with the interests of dentistry. Anything which it might advocate to the injury of the dental profession generally would eventually redound to its own harm. This thought has not been lost sight of for a moment in all its past history. But it is to call attention to the converse fact which apparently is sometimes forgotten,—that, in the larger sense, whatever is hurtful to this Company will inevitably be prejudicial to the best interests of the dental profession,—that these lines are written.

Apropos of the foregoing the facilities of the Company of every kind are larger and better now than ever before, and it is constantly adding to them. The demand for its productions was never so great as now, and it is in a position and has the determination to do better work for the dental profession than ever before.

THE ABBOTT AUTOMATIC PLUGGER.



Patented in Great Britain and United States, August 16, 1887.

The Abbott Automatic Mallet was designed specially to avoid the defects of other appliances of its class. It is simple in construction and combines with the usual direct blow a back-action movement, actuated by the same mechanism, so that with it gold can be packed into cavities in almost any position in the mouth.

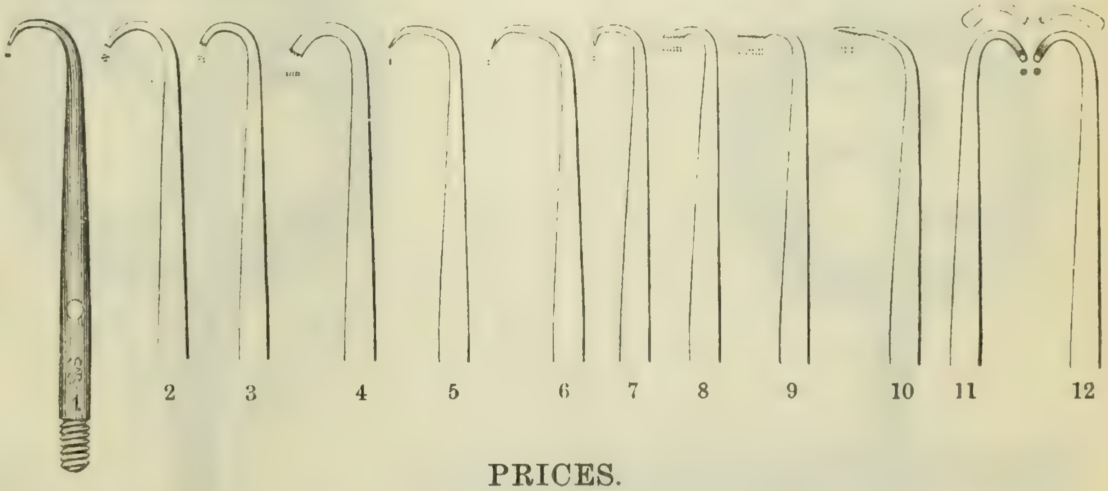
The working parts—pivotal latch, tripping mechanism, hammer, and spring—are entirely free from the case, being carried upon a spindle which passes centrally through it. This plan of construction avoids friction. Each end of the spindle is socketed for the reception of the plugger points, one end giving the direct push or thrust-blow, the other the pull or back-blow.

The Mallet combines simplicity of construction with easy, effective operation.

All the parts liable to wear are made of hardened steel, and the instrument throughout is made in the best manner.

For the direct blow the Cone-Socket or Snow & Lewis points, either of which will fit the socket, may be used. For the back-action blow, Dr. Abbott has devised the set of points shown herewith. It is believed they will cover all requirements.

Price, Nickel-plated $9.00



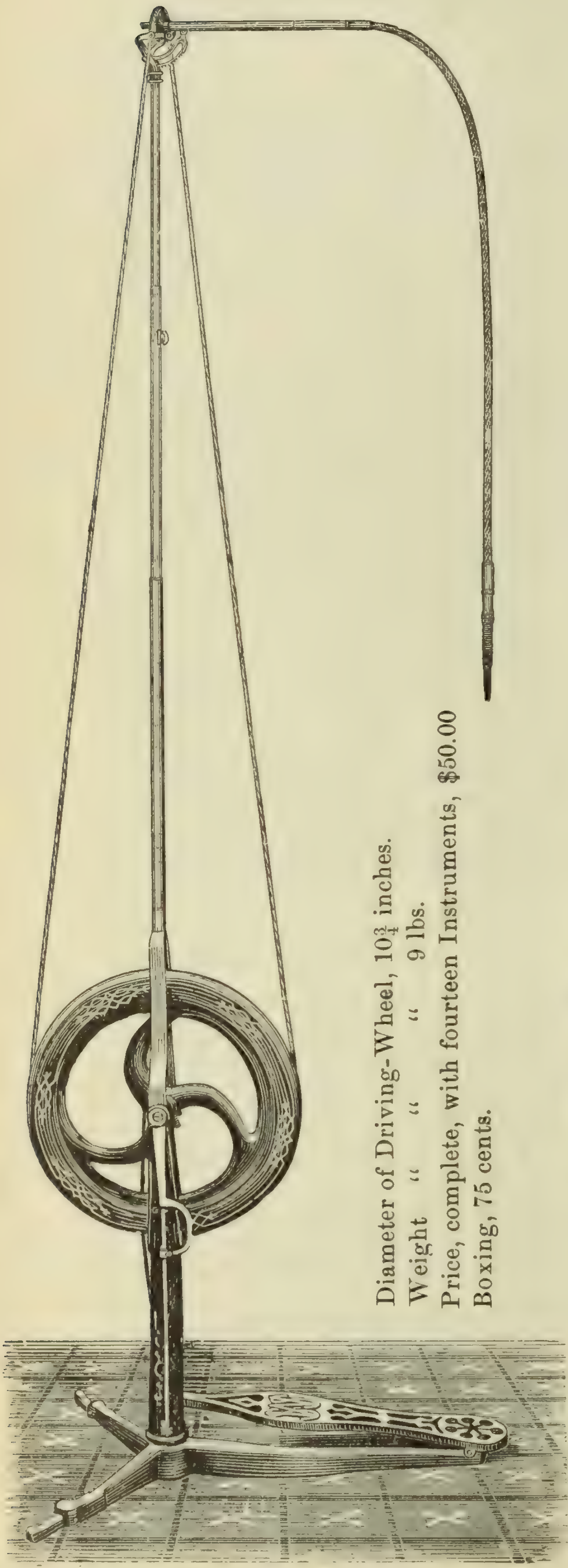
PRICES.

Nos. 1 to 7 inclusive	each	$0.40
" 8 to 12 "	"	.50
Set of 12 Points		5.25

The S. S. White Improved Dental Engine.

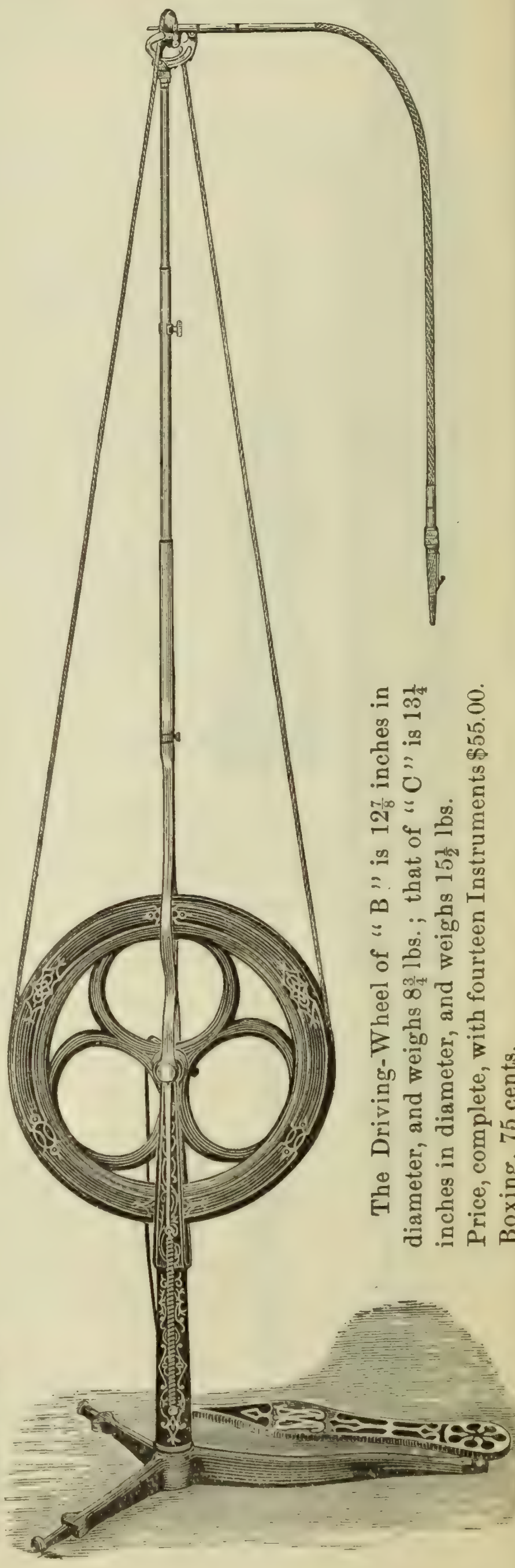
Patented Aug. 4, 1874; Sept. 2, 1879; July 6, 1880. Reissues, Jan. 2, 1877; March 4, 1879; March 11, 1879; Nov. 4, 1879. English Patent, Aug. 13, 1879.

"A."



Diameter of Driving-Wheel, $10\frac{3}{4}$ inches.
Weight " " 9 lbs.
Price, complete, with fourteen Instruments, $50.00
Boxing, 75 cents.

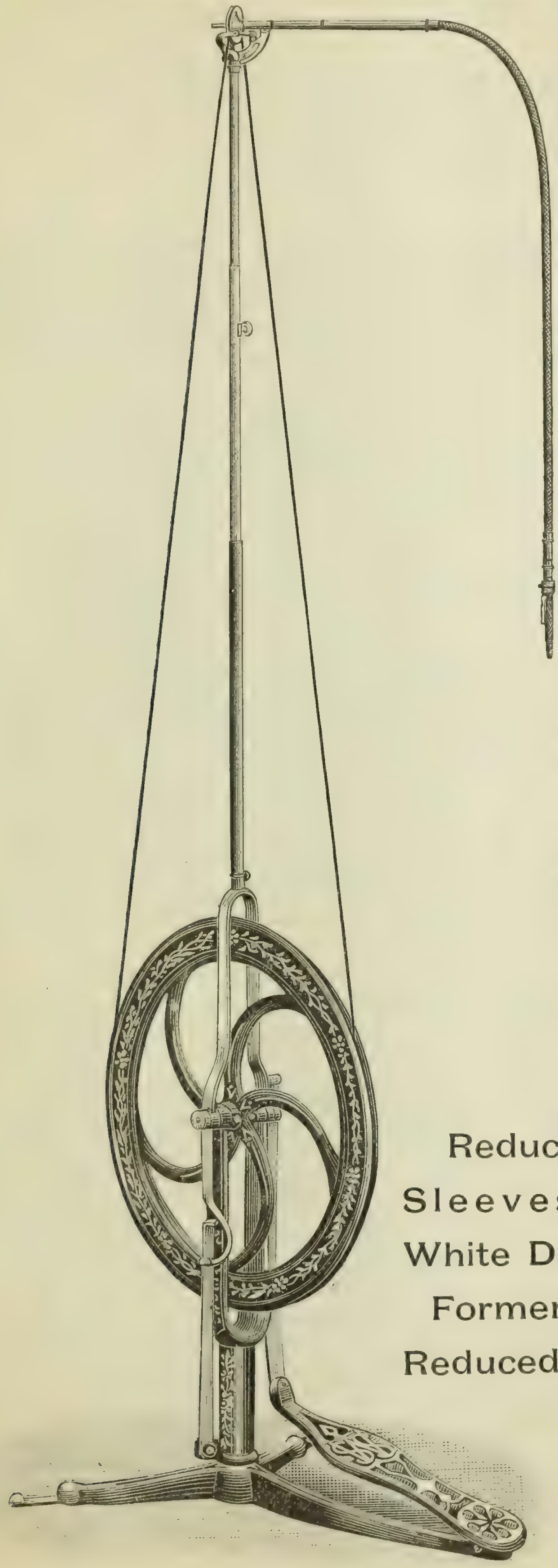
"B" and "C."



The Driving-Wheel of "B" is $12\frac{7}{8}$ inches in diameter, and weighs $8\frac{3}{4}$ lbs.; that of "C" is $13\frac{1}{4}$ inches in diameter, and weighs $15\frac{1}{2}$ lbs.
Price, complete, with fourteen Instruments $55.00.
Boxing, 75 cents.

New Large-Wheel Dental Engine, "D."

Patented Aug. 4, 1874; Sept. 2, 1879; July 6, 1880. Reissues, Jan. 2, 1877; March 4, 1879; March 11, 1879; Nov. 4, 1879. English Patent, Aug. 13, 1879.



The special feature of this Engine is the very large and heavy driving-wheel, by which a speed equal to that of the ordinary form "A" can be attained with only two-thirds the number of movements of the treadle. The weight is distributed to assist in increasing the momentum, most of it being in the rim. The advantage of the slower treadle movement, in addition to the lessened exertion in running the engine, is the quicker and easier stop which it permits.

The diameter of the driving-wheel is 15 inches; the weight, $14\frac{3}{4}$ lbs.

Price, with fourteen instruments, $55.00.

Boxing, 75 cents.

Reduction in price of Sleeves for the S. S. White Dental Engines.

Formerly $2.50 each.

Reduced to $1.50 "

A New Departure in Dental Instruments.

REDUCTION IN PRICES.

We experience a just sense of pride in being able to present illustrations of the *best dental instruments* ever manufactured,—best not only in quality of workmanship, for which we have for many years held undisputed the palm of superiority, but best in general appearance, best in arrangement, best in their adaptation to the purposes for which they are intended. This is strong language, but the facts justify any praise that can be bestowed upon them.

As we have previously announced, a revision of the points has been in progress for a long time. Many months since we formed what we were pleased to term an "Instrument Congress," the object of which was to reduce to order and system the almost innumerable "sets" of instruments which had found place in dental practice through a long term of years, and to bring about certain improvements in manufacture which seemed desirable. This Congress consisted of six practical men, who with the whole mass of instruments around them began their work. Patiently and carefully they compared the multifarious forms, culling out of one set the points which duplicated or closely resembled those found in other sets, making alterations wherever it was deemed desirable, classifying points of the same general character, considering and deciding upon the most appropriate forms and styles of handles for the various classes, etc. The work was arduous, more especially in the division of pluggers, where thousands of points had to be compared, criticised, and collated. But the result amply repays the labor and anxiety expended. Order has been brought out of chaos. Our dental instruments are now uniform,—a given Cone-Socket point is the same as the corresponding Long-Handle instrument. The choosing of instruments from our stock will hereafter be comparatively a simple matter.

These instruments are now nickel-plated, it being our intention to eventually dispense with bronzing, though we have a stock of bronzed-handle instruments now superseded, from which those who desire them can be supplied while the stock lasts.

The forms of handles adopted in the Long-Handle classes are as follows: For Excavators, Octagon, with delicately traced cross-lines giving them the appearance of frost-work, and a "feel" just removed from the perfect smoothness of a high polish; for Burnishers, Chisels, Scalers, Amalgam Instruments, etc., File-cut, Ball-end; and for Pluggers, Taper File-cut. This file-cutting—a marvel of perfection which has never before been equaled or even fairly approached—is done by specially devised machinery. The Excavators are of the same high grade which made our well-known "Flint" Excavators famous.

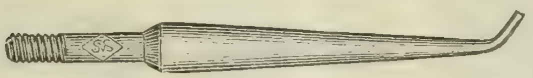
Notwithstanding all the perfection of these instruments, we have been enabled, by improvements in methods of manufacture, to reduce the cost of production, and as is our custom in such cases we give the advantage thus gained to the consumer. As will be seen by examining the pages following, we have made very material reductions from the prices formerly ruling. The reductions pertain not only to the instruments but also to the Knurled Cone-Socket Handles.

Cone-Socket Instruments.

Patented November 16, 1880.

X.

Y.



Two styles of bit shanks have been found desirable: a light shaft, *X*, for small, delicate points; and a heavier one, *Y*, adapted to the points which in long-handled instruments require ¼-inch file-cut handles. This same principle of adaptation to use is carried out in the Cone-socket Handles. While any of the Handles will carry any one of the points, operators will have greater satisfaction in the use of these instruments if they adhere to the suggestions given below as to the place which each Handle is intended to fill.

Handles Nos. 1 to 7 are steel, nickel-plated. Each of them is kept in stock in the six styles of knurls illustrated, experience having demonstrated that these are all the designs called for. Nos. 8 to 11 are ebony, with nickel-plated ferrules. All the Handles are shown full size. Their special uses are as follows:

No. 1. Smallest. Generally used for small and medium excavators, explorers, nerve instruments, etc., with *X* shank.

No. 2. For large excavators, small pluggers, etc., having *X* shank.

No. 3. For heavier hand-points on *Y* shank.

No. 4. For delicate mallet pluggers, as Varney's, Chappell's, etc., *X* shank.

No. 5. For the larger mallet pluggers, *Y* shank.

Nos. 6 and 7. Double-end. For spatulas, cement, and amalgam instruments, etc. No. 6 for *X* shank, No. 7 for *Y* shank.

Nos. 8, 9, 10, and 11. Specially made for the convenience of operators who have been accustomed to use instruments mounted on large, light-weight handles. No. 8 is adapted for burnishers, heavy chisels, etc., *Y* shank. Nos. 9, 10, and 11, *X* shank.

ELECTRICITY WITHOUT BATTERIES FOR DENTISTS.

We are now prepared to supply an Electrical Resistance for utilizing the current employed in the ordinary Edison incandescent lamp circuits to run the Electro-Magnetic Mallet, the Electrical Laryngoscope, the Electric Lantern, etc. Wherever this current is available, it affords, with the Resistance, a perfect substitute for a battery. We look to it to create a wider demand for the unquestioned advantages of electricity in dental operations, as it relieves the dentist of all concern about the condition of his battery, and assures him always of the constancy of his current. In fact, in some respects this current is superior to that from a primary battery, inasmuch as the magnets of the Electro-Magnetic Mallet, for instance, do not become heated in long operations, the sparking at the automatic break being greatly reduced when run by the incandescent lamp current.

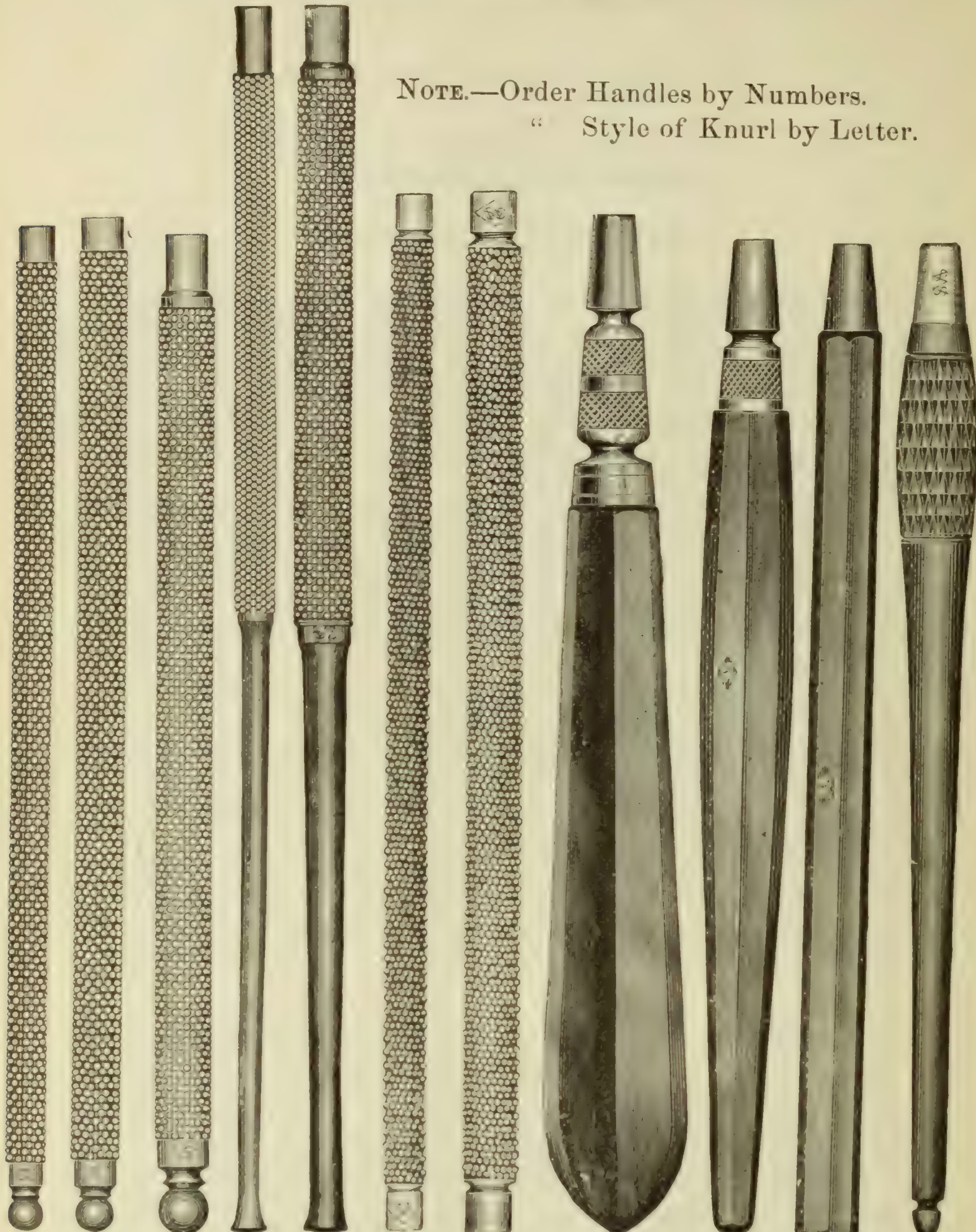
We have devised an additional appliance which this new improvement makes available,—an Electric Hot-air Syringe,—with which a tooth may be thoroughly and effectively dried.

The apparatus will shortly be illustrated in the DENTAL COSMOS.

Socket-Handles for Cone-Socket Points.

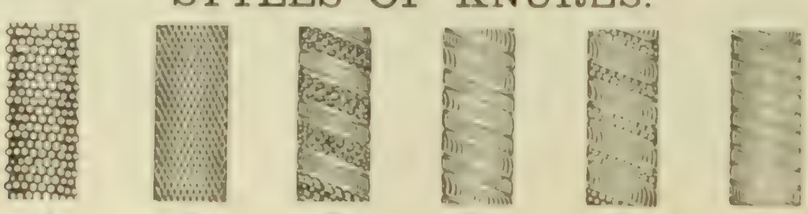
Patented November 16, 1880.

Note.—Order Handles by Numbers.
" Style of Knurl by Letter.



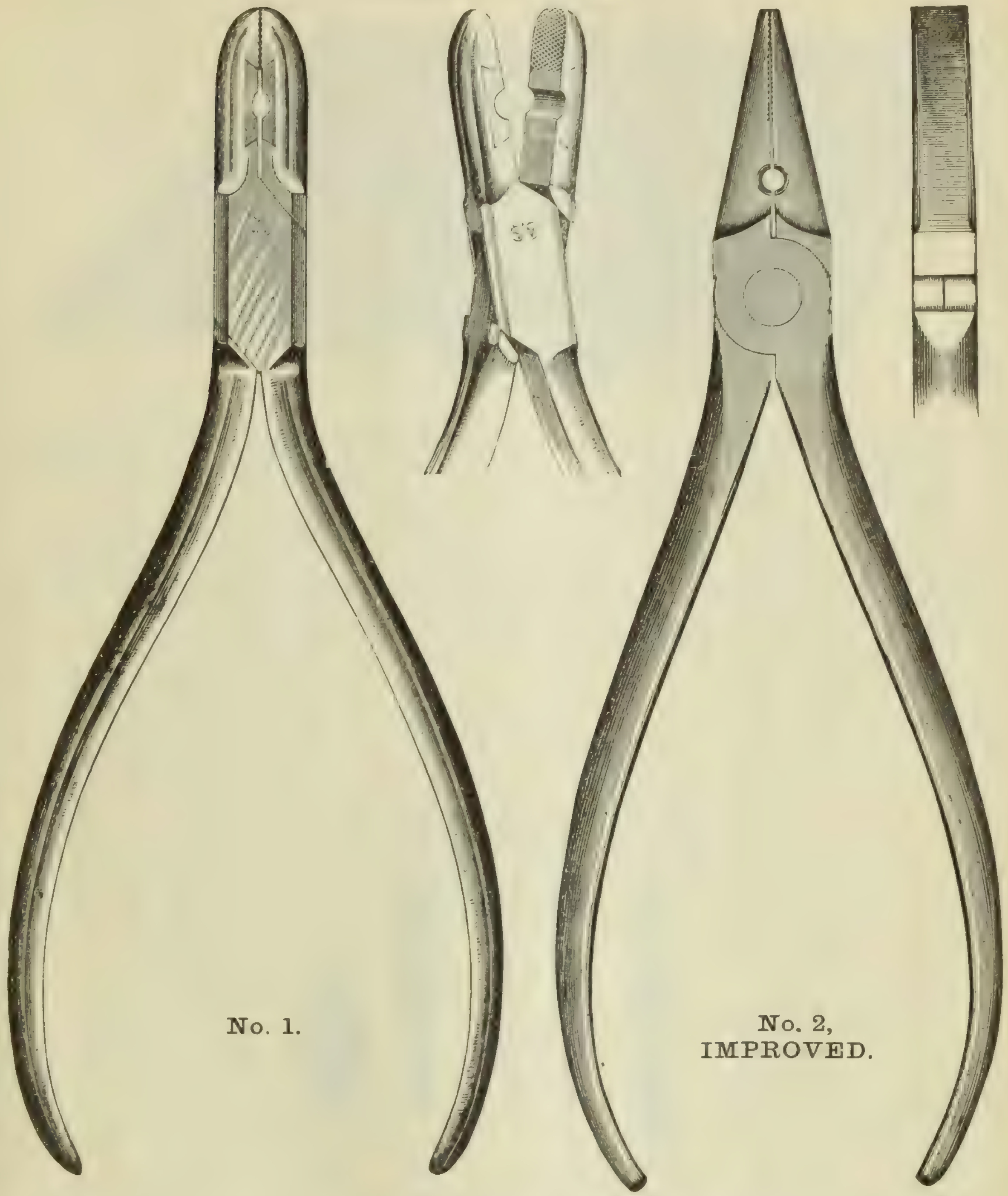
1	2	3	4	5	6	7	8	9	10	11
$1.25 per doz.		$1.75 per doz.	$2.50 per doz.				$7.20 per doz.	$5.00 per doz.	$3.00 per doz.	$4.00 per doz.

STYLES OF KNURLS.



A B C D E F

Pliers for Inserting and Removing Cone-Socket Points.



In order to set the points firmly in the handles it will be necessary to use more force than can be given with the fingers.

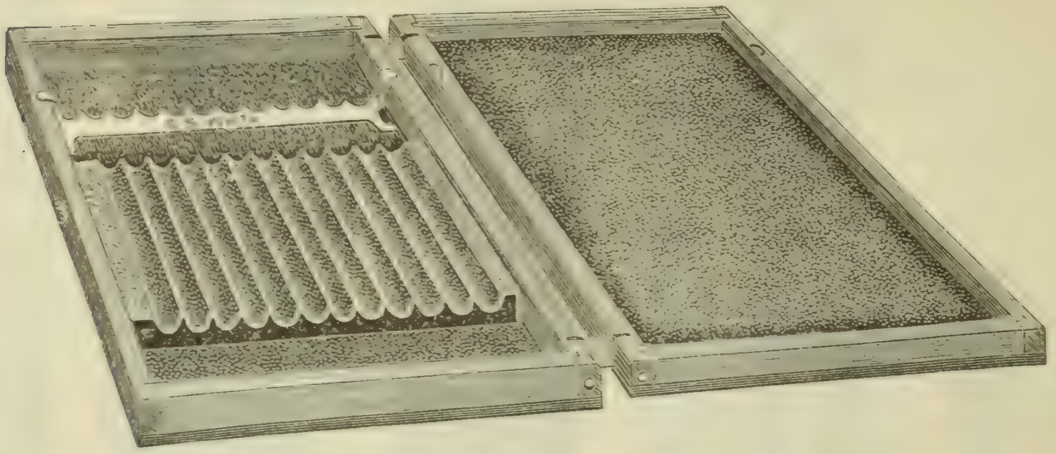
These Pliers are especially adapted for the purpose.

No. 1 is our own make, finely finished and nickel-plated. In both jaws are inserted (dove-tailed) copper plates which prevent the marring of the instruments and give firmer grasp than can be had with the No. 2 Pliers.

No. 2 Improved. A flat-nosed Plier with depressions ground in the jaws. Polished and nickel-plated.

Price, No. 1	per pair	$1.75
" No. 2 Improved	"	.90

Case for Knurled-Handle Cone-Socket Instruments.

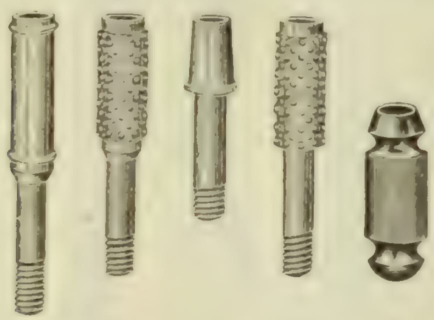


These Cases are made of mahogany, with the lids so hinged as to fold beneath the body of the Case when open.

The instruments are fitted in a grooved block covered with silk-finish cotton velvet. A nickel-plated rack for elevating the points is hinged to the sides of the Case, which holds twelve handles of the smaller diameter.

Price, No. 1 . . . . $1.50

Socket-Hubs.



A B C D E

A and B screw into the Cone-Socket Handles and take Snow & Lewis automatic mallet points.

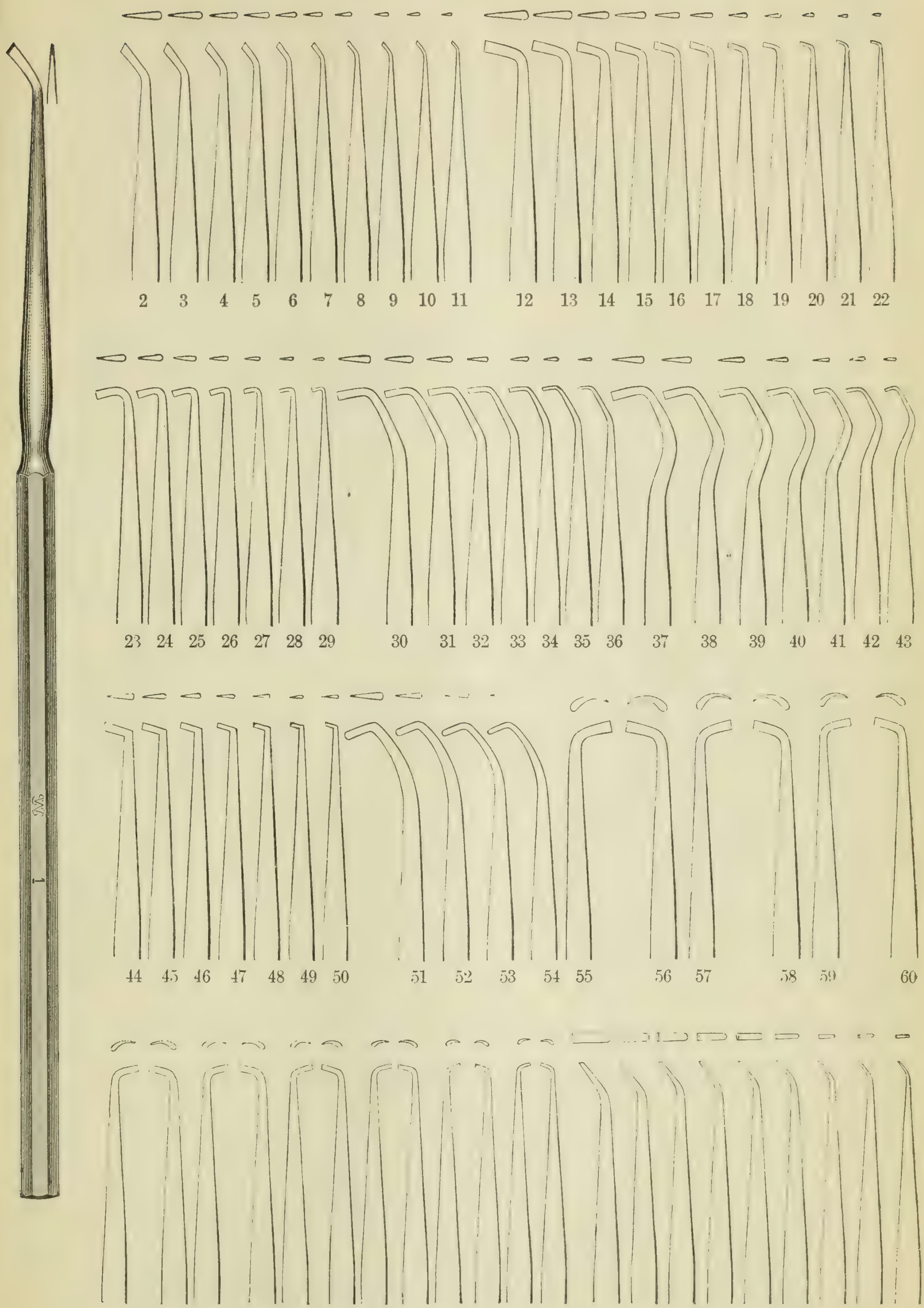
C and D screw into Snow & Lewis sockets and take Cone-Socket points.

E is designed for use between the thumb and finger for rotating nerve-instruments.

PRICES.

"A," Hardened Steel	each	$0.30
"B," Knurled "	"	.15
"C," Hardened "	"	.30
"D," Knurled "	"	.15
"E," " "	"	.15

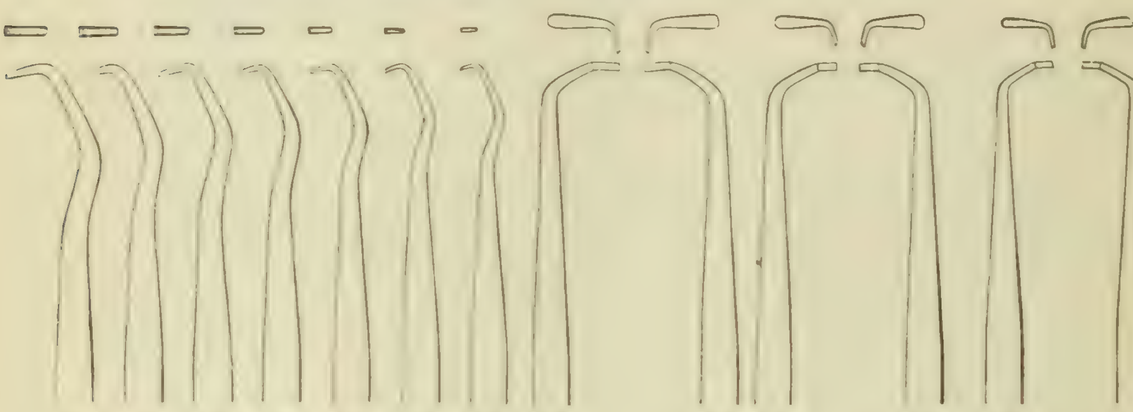
EXCAVATORS.



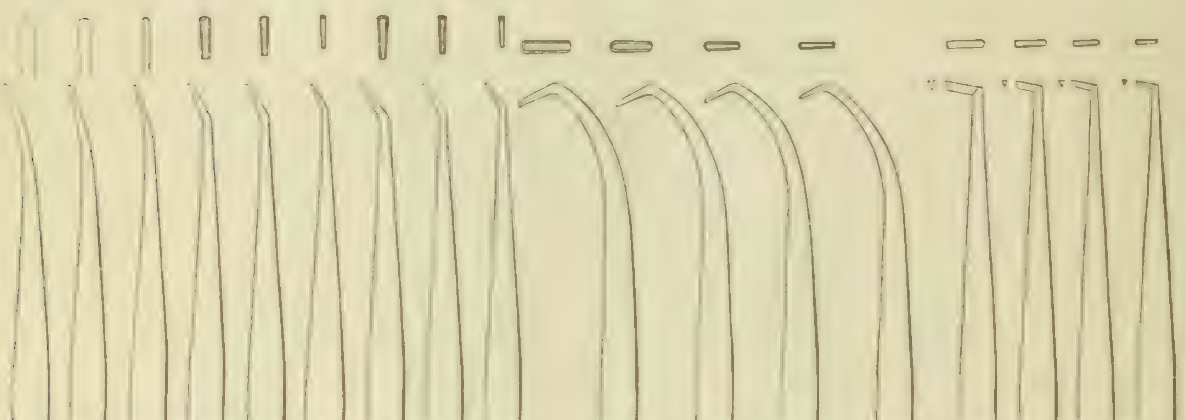
See Prices, page 13.

EXCAVATORS.

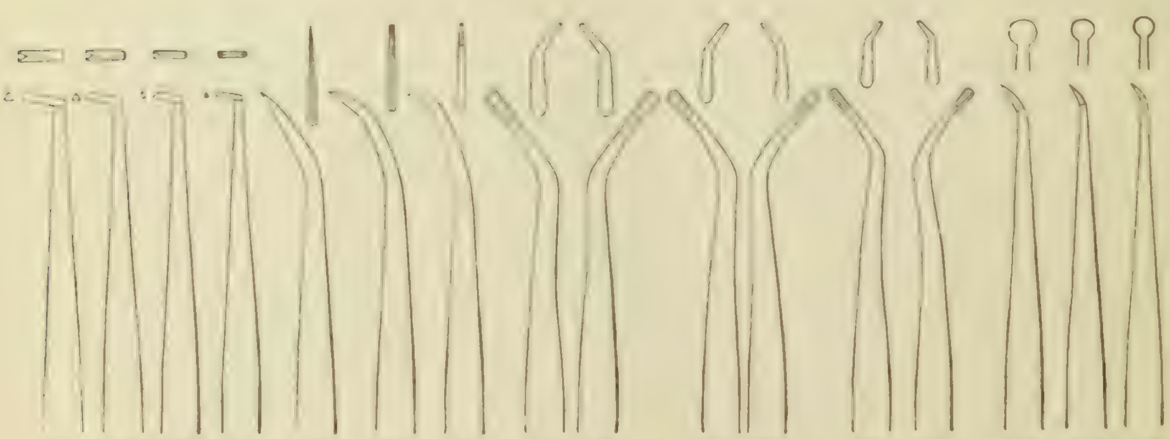
82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97



98 99 100 101 102 103 104 105 106 107 108 109 110



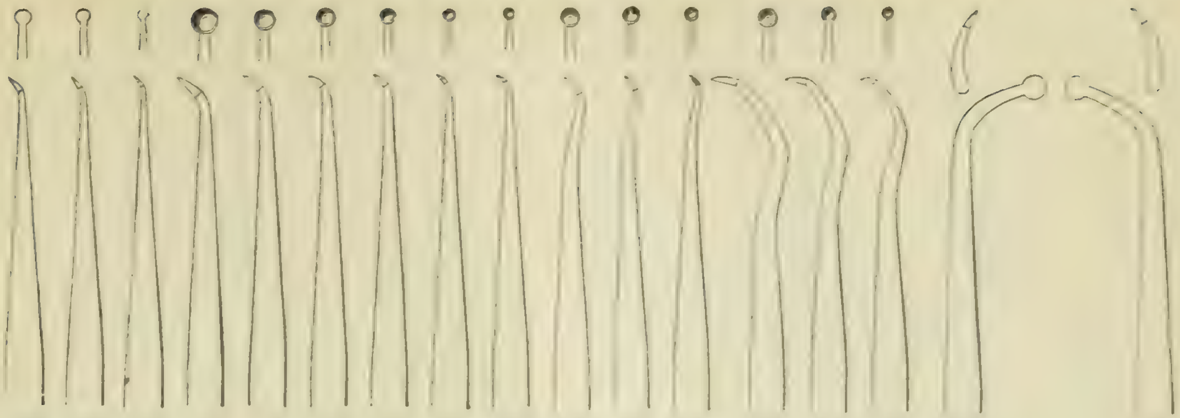
111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127



128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143

See Prices, page 13.

EXCAVATORS.



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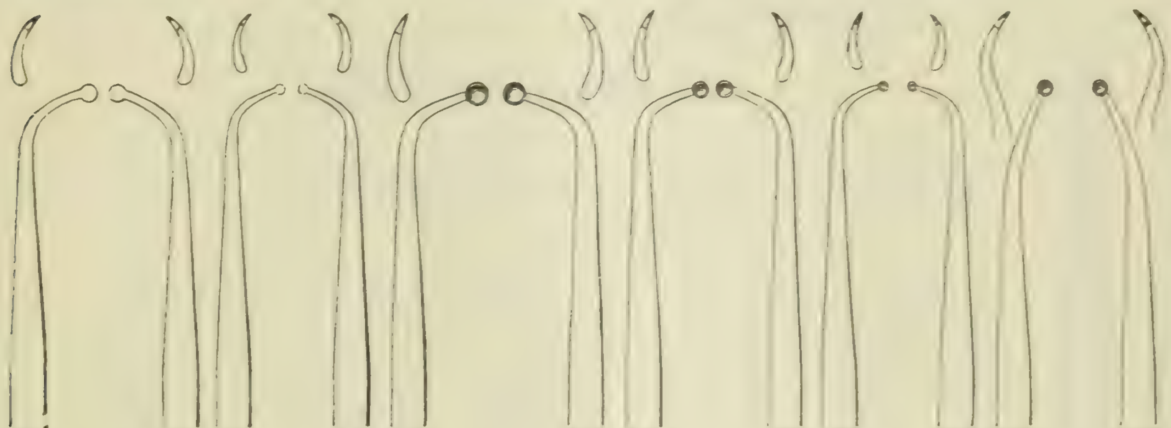
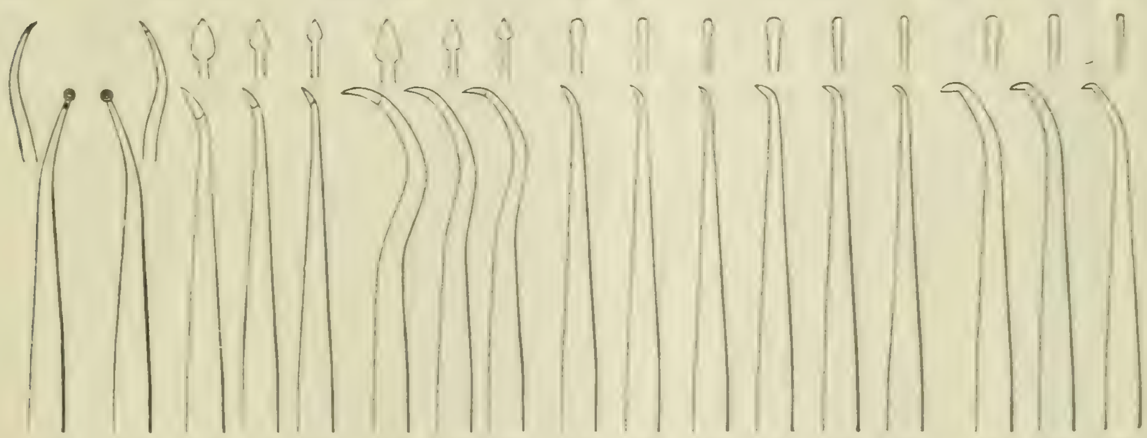


161 162 163 164 165 166 167 168 169 170 171 172



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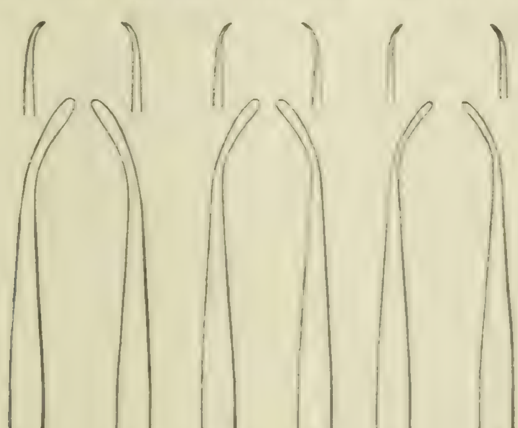
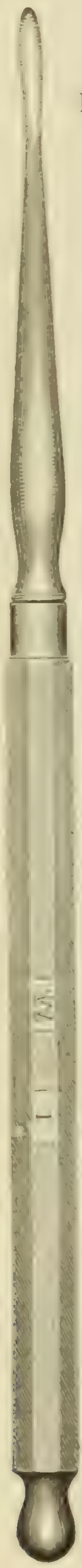


190 191 192 193 194 195

PRICES.

Octagon Handles, Nickel-plated	per doz. $2.50
Cone-Socket Points	each .12

For prices of Cone-Socket Handles see page 8.

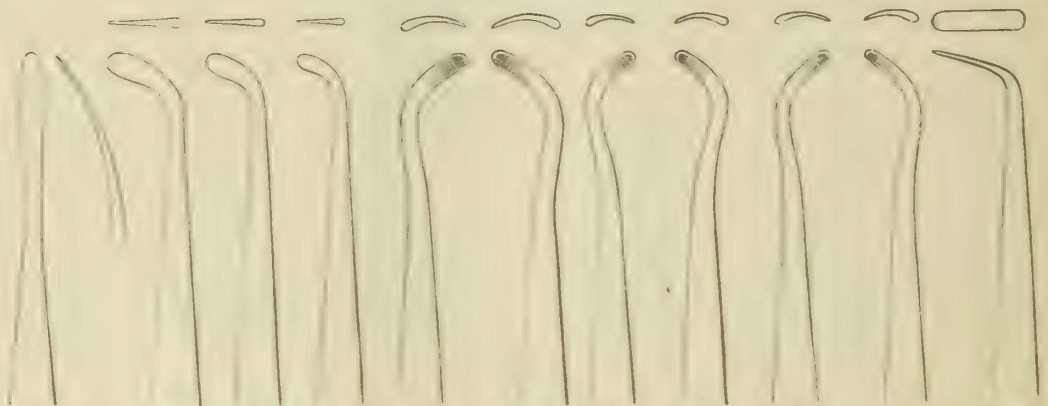


EXPLORERS.

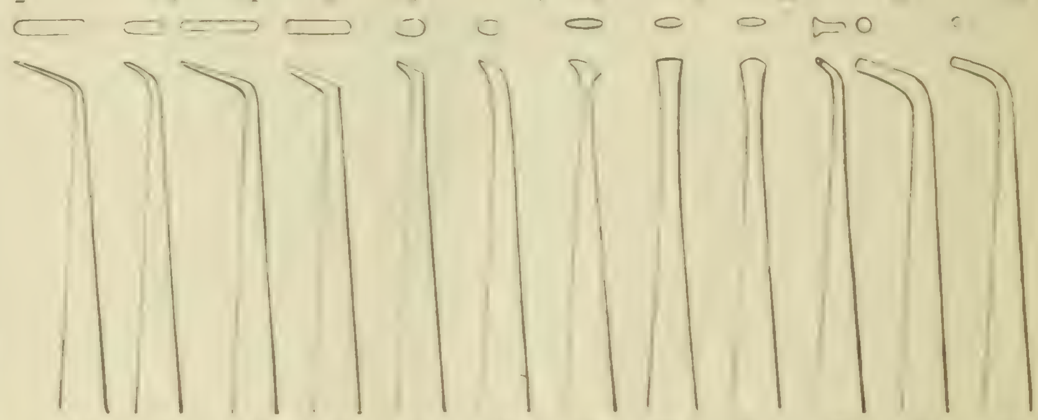
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

PRICES—Octagon Handle, Nickel-plated . . . . per doz. $2.50
" Cone-Socket Points . . . . each .12

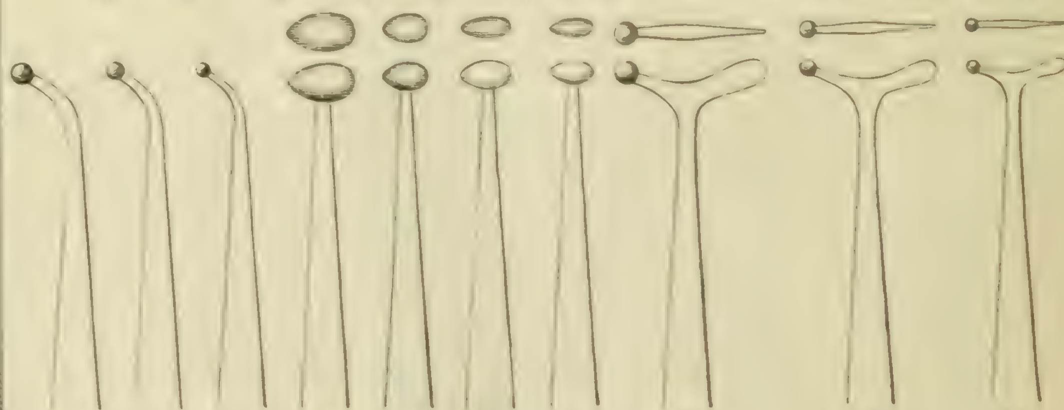
BURNISHERS.



2 3 4 5 6 7 8 9 10 11 12



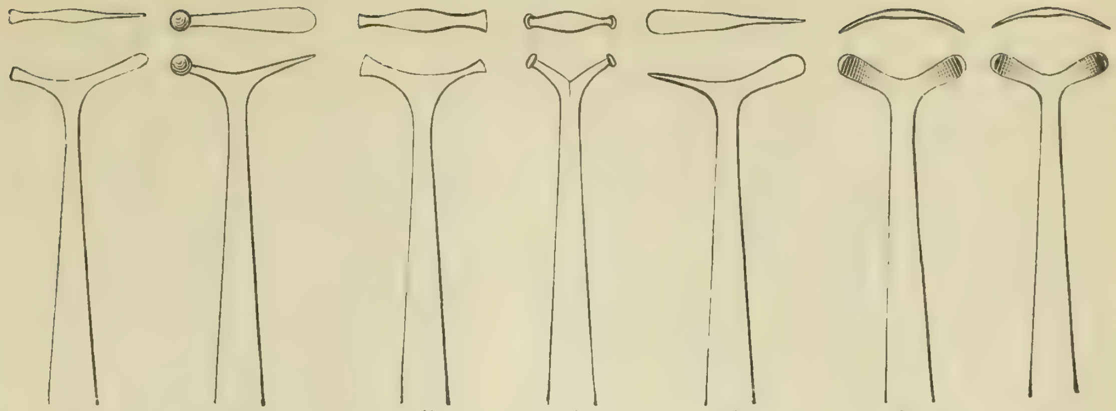
13 14 15 16 17 18 19 20 21 22 23 24



25 26 27 28 29 30 31 32 33 34

See Prices, page 15.

BURNISHERS.



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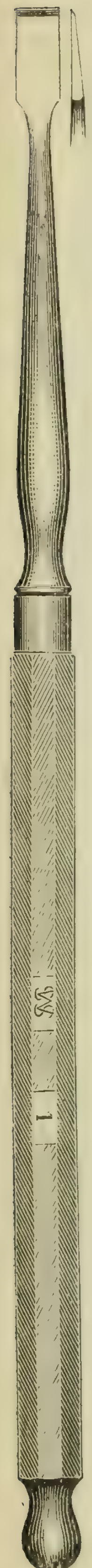
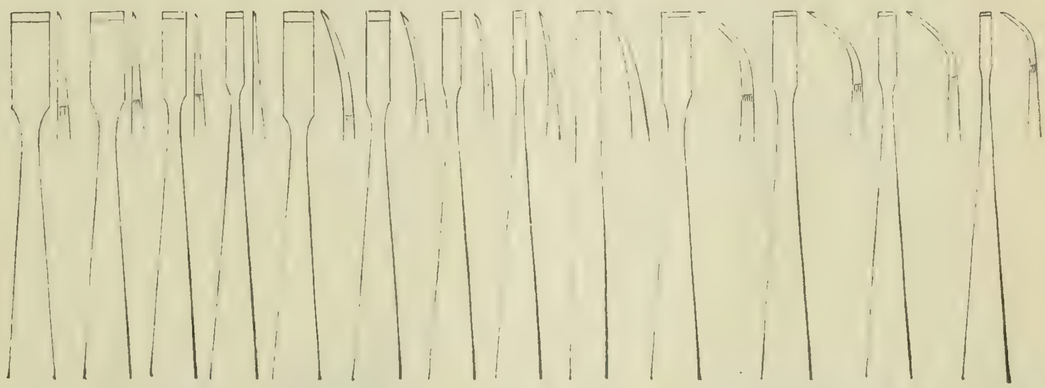


PRICES.

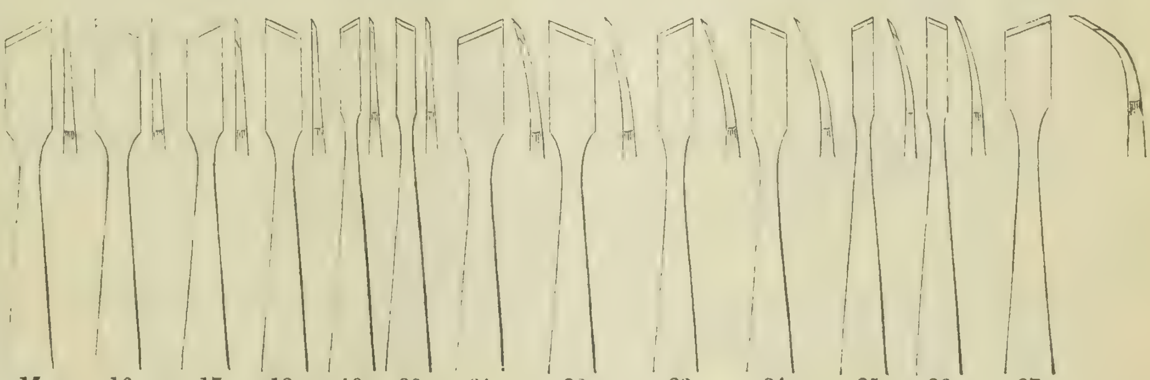
Nos.	1 to 31—¼-in. File-cut Handles, Nickel-plated	each	50 cents.
"	32 to 41— " " " " " "	"	60 "
"	1 to 31—Cone-Socket Points	"	35 "
"	32 to 41— " " "	"	45 "

For prices of Cone-Socket Handles see page 8.

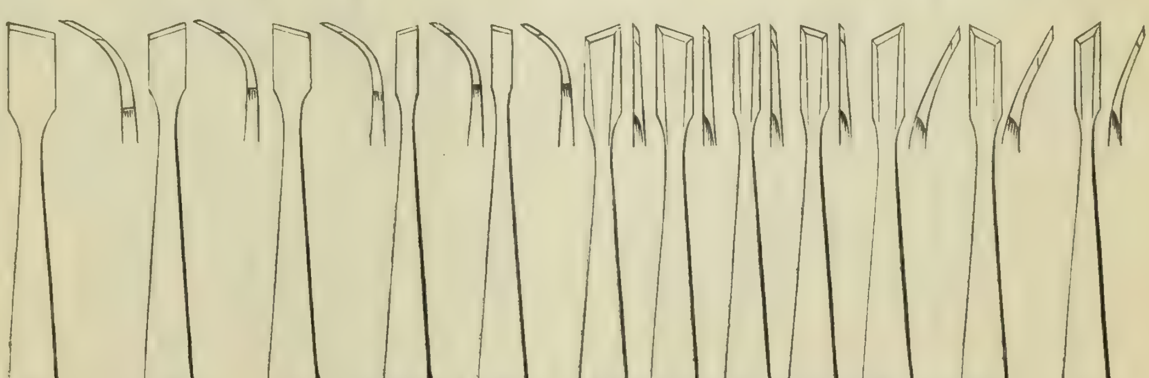
CHISELS.



2 3 4 5 6 7 8 9 10 11 12 13 14

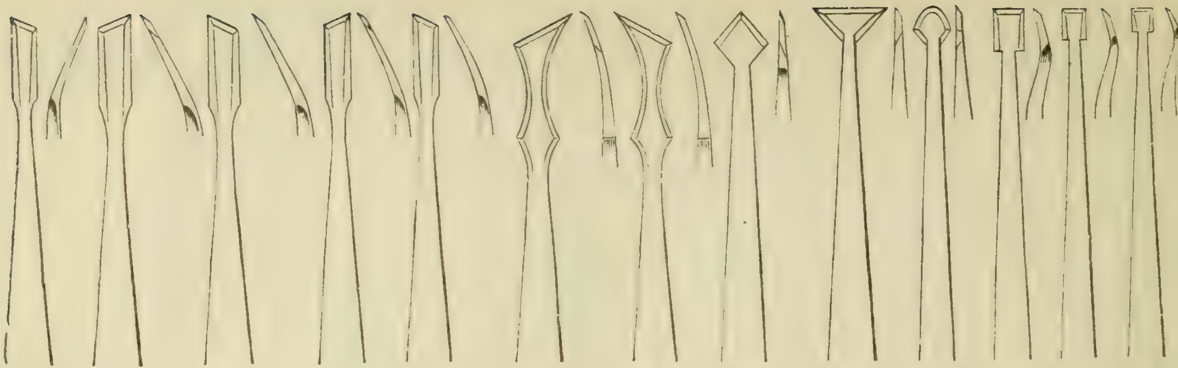


15 16 17 18 19 20 21 22 23 24 25 26 27

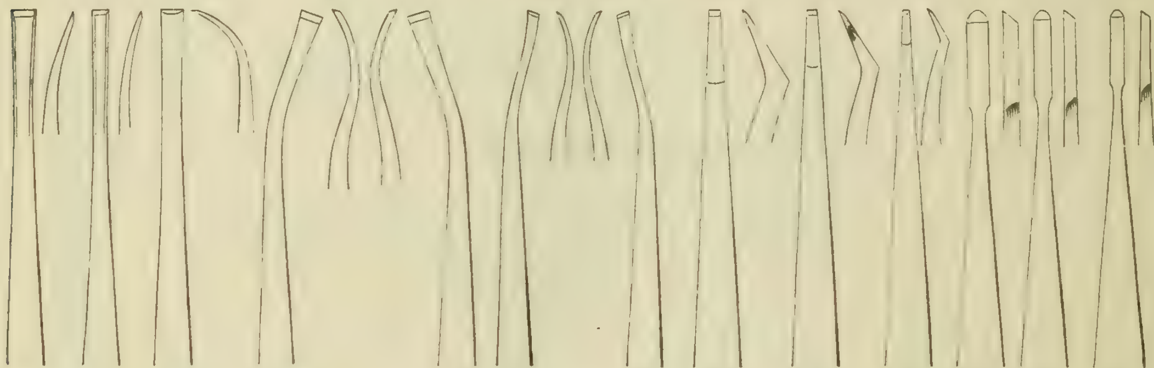


28 29 30 31 32 33 34 35 36 37 38 39

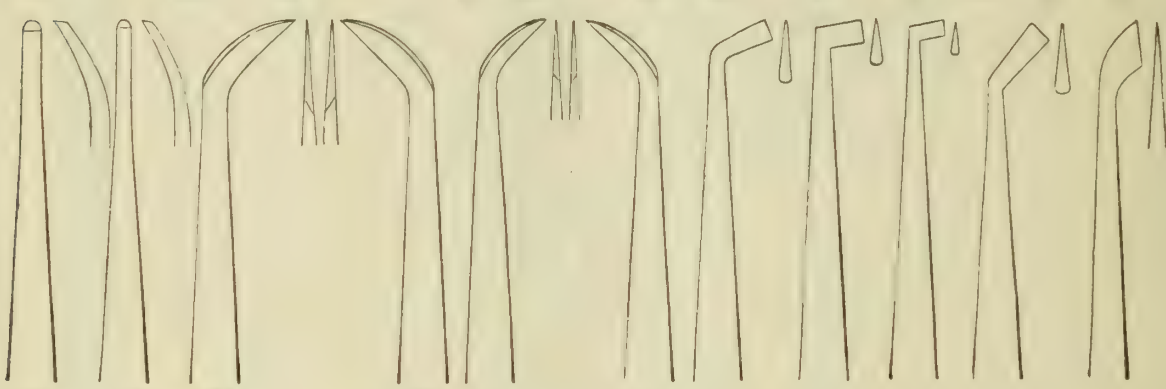
CHISELS.



40 41 42 43 44 45 46 47 48 49 50 51 52



53 54 55 56 57 58 59 60 61 62 63 64 65



66 67 68 69 70 71 72 73 74 75 76

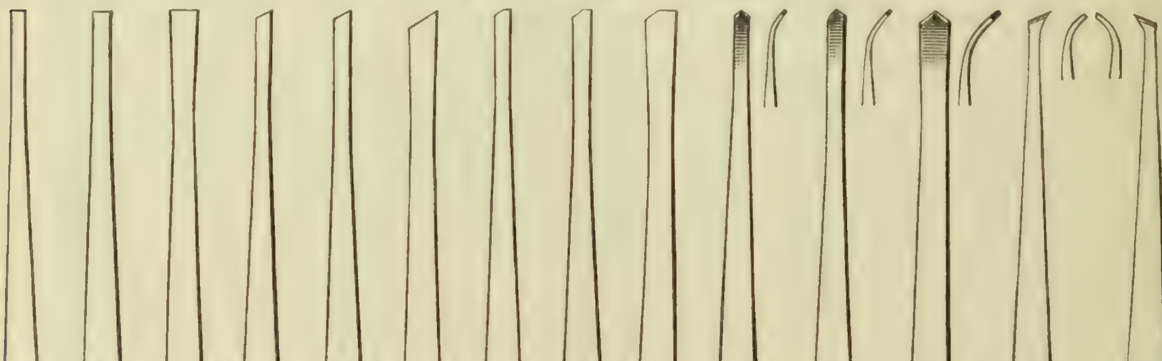
PRICES.

File-cut Handles, Nickel-plated	each 50 cents.
Cone-Socket Points	" 35 "

See prices of Cone-Socket Handles, page 8.

HARD BITS.

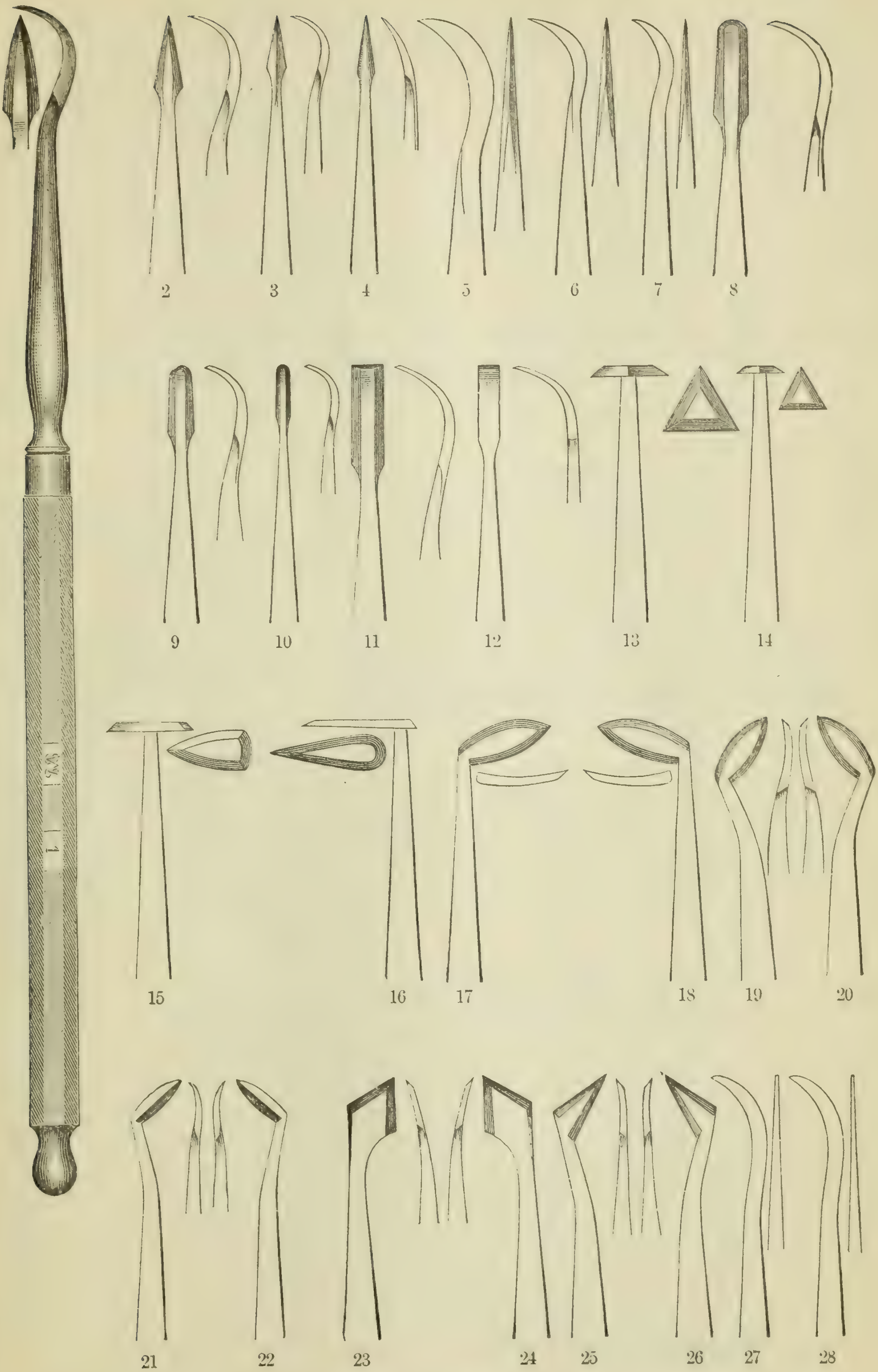
These are the well-known instruments advertised at p. 153 of our 1876 catalogue. Except Nos. 13 and 14 they are square-edge.



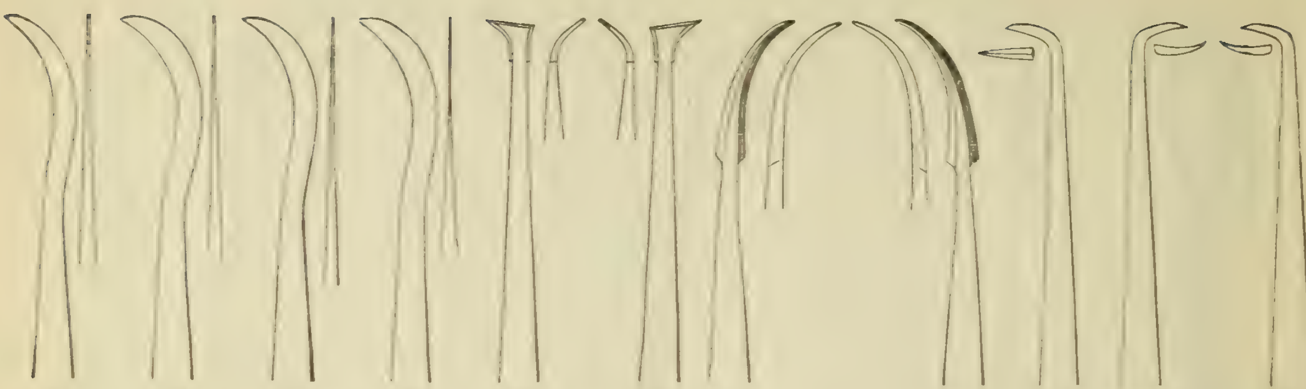
1 2 3 4 5 6 7 8 9 10 11 12 13 14

Made only for Cone-Socket Handles . . each 30 cents.

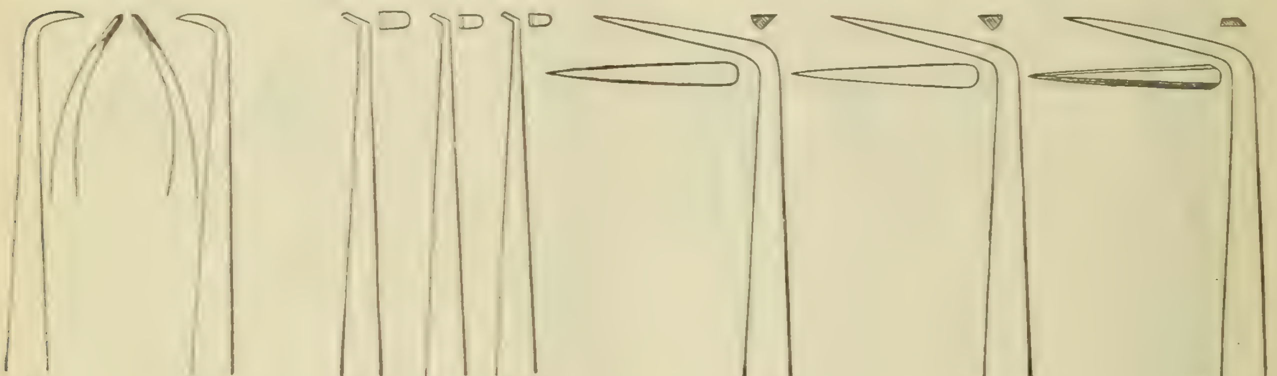
SCALERS.



SCALERS.



29 30 31 32 33 34 35 36 37 38 39



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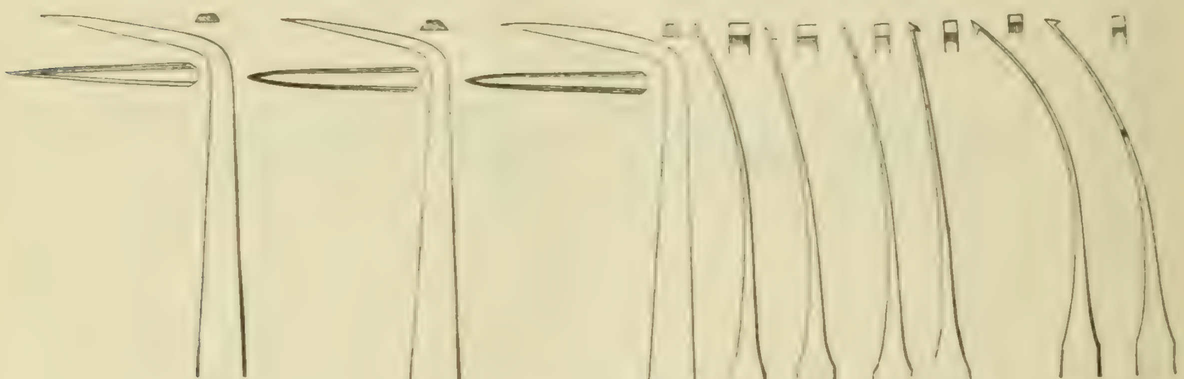
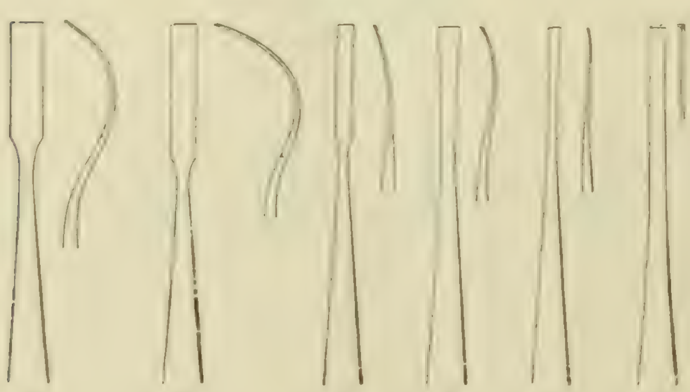


48 49 50 51 52 53 54 55 56



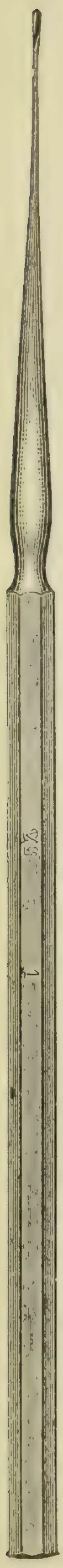
57 58 59 60 61 62

PRICES.

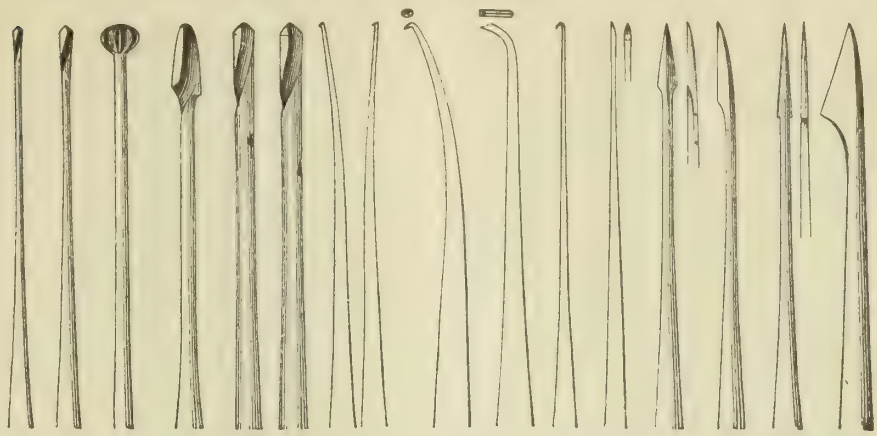
File-cut Handles, Nickel-plated	. . . .	each 50 cents.
Cone-Socket Points	. . . .	" 35 "

For prices of Cone-Socket Handles see page 8.

NERVE INSTRUMENTS.



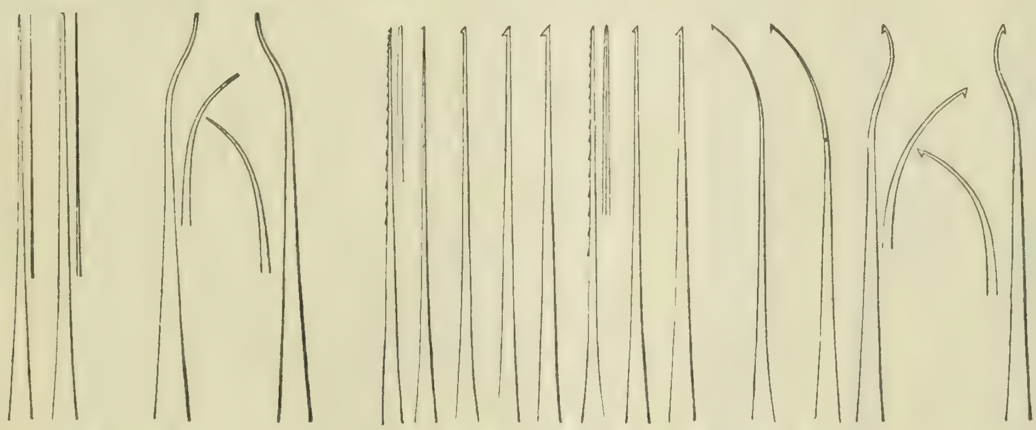
DR. CORYDON PALMER'S.



2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

HOW'S. HUNTER'S. DR. B. F. ARRINGTON'S EXTRACTORS.

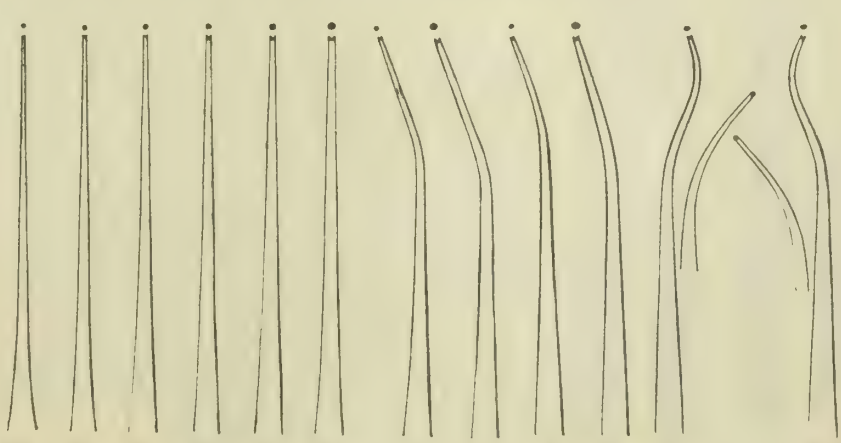
Soft. Spring Temper.



18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33

DR. B. F. ARRINGTON'S PLUGGERS.

Soft. Spring Temper.

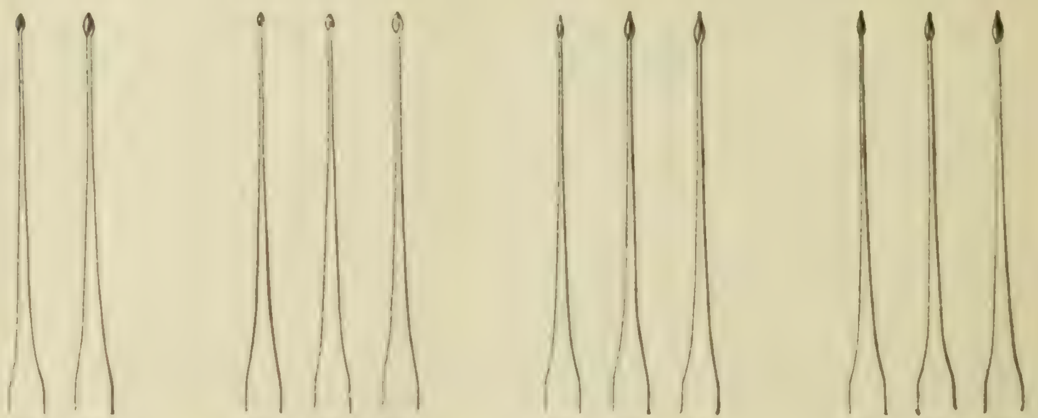


34 35 36 37 38 39 40 41 42 43 44 45

NERVE INSTRUMENTS.

GATES'S DRILLS. — Flexible or Drawn temper. — Inflexible or Spring temper.

GATES-GLIDDEN DRILLS. — Flexible or Drawn temper. — Inflexible or Spring temper.



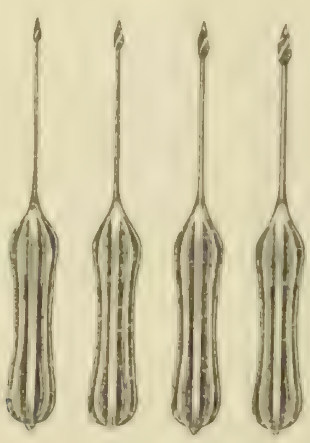
47 48 49 50 51 52 53 54 55 56 57

PRICES.

Octagon Steel Handles, Nickel-plated.		Cone-Socket Points.	
Nos. 1 to 7 . . .	each $0.45	Nos. 1 to 7 . . .	each $0.40
" 8 " 13 . . .	" .30	" 8 " 13 . . .	" .25
" 14 " 17 . . .	" .40	" 14 " 17 . . .	" .35
" 18 " 21 . . .	" .25	" 18 " 21 . . .	" .20
" 22 " 51 . . .	" .25	" 22 " 51 . . .	" .20
" 52 " 57 . . .	" .40	" 52 " 57 . . .	" .35

For prices of Cone-Socket Handles see page 8.

NERVE-CANAL DRILLS.



1 2 3 4

To overcome the difficulty sometimes experienced in enlarging nerve-canals in posterior teeth with drills operated by the engine, Dr. W. W. Walker suggested the formation of a finger-hold upon the shank, so that the Drills could be operated by the thumb and finger. They will be found especially useful in cleaning the anterior roots of lower molars and bicuspids. The slight projection seen at the lower end of the handle serves as a center to revolve the Drill upon. Made in four sizes corresponding to those sold for the engine.

Price . . . . . each 50 cents.

NERVE INSTRUMENTS.

HOPKINS'S NERVE-CANAL REAMERS.

1

2 3 4 5 6 7

This set of Reamers was devised by Dr. E. E. Hopkins for enlargement of the nerve-canal prior to the permanent filling of the same; and he lays stress upon the progressive use of each number of the series, beginning with No. 1, and continuing until the last number employed shall so enlarge the cervical opening that free access may be had along the entire course of the canal to its apical termination; and such result is attained without risk of the breaking of the Reamer heads, because these so gradually increase in diameter that there is no considerable strain upon the thin and long shanks of the instruments. The peculiar shapes of the short cutting heads also permit angular access to the canals through lateral cavities in the crowns. Cut No. 1 shows the size and shape of the handles.

Price, Octagon Steel Handles,
Nickel-plated . each .30

Not kept in stock for Cone-Socket Handles.

Nerve Extractors.

Nerve Probes.

Nerve Extractors, Hook and Barb, Octagon handles, Nickel-plated. Made of best quality steel, drawn temper; will follow the canal readily.

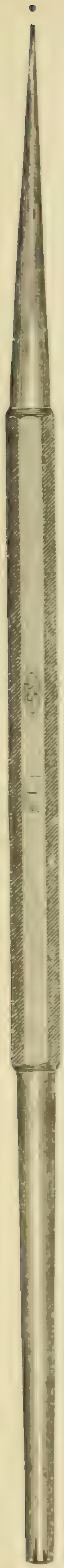
Price . . . . per doz. $2.50

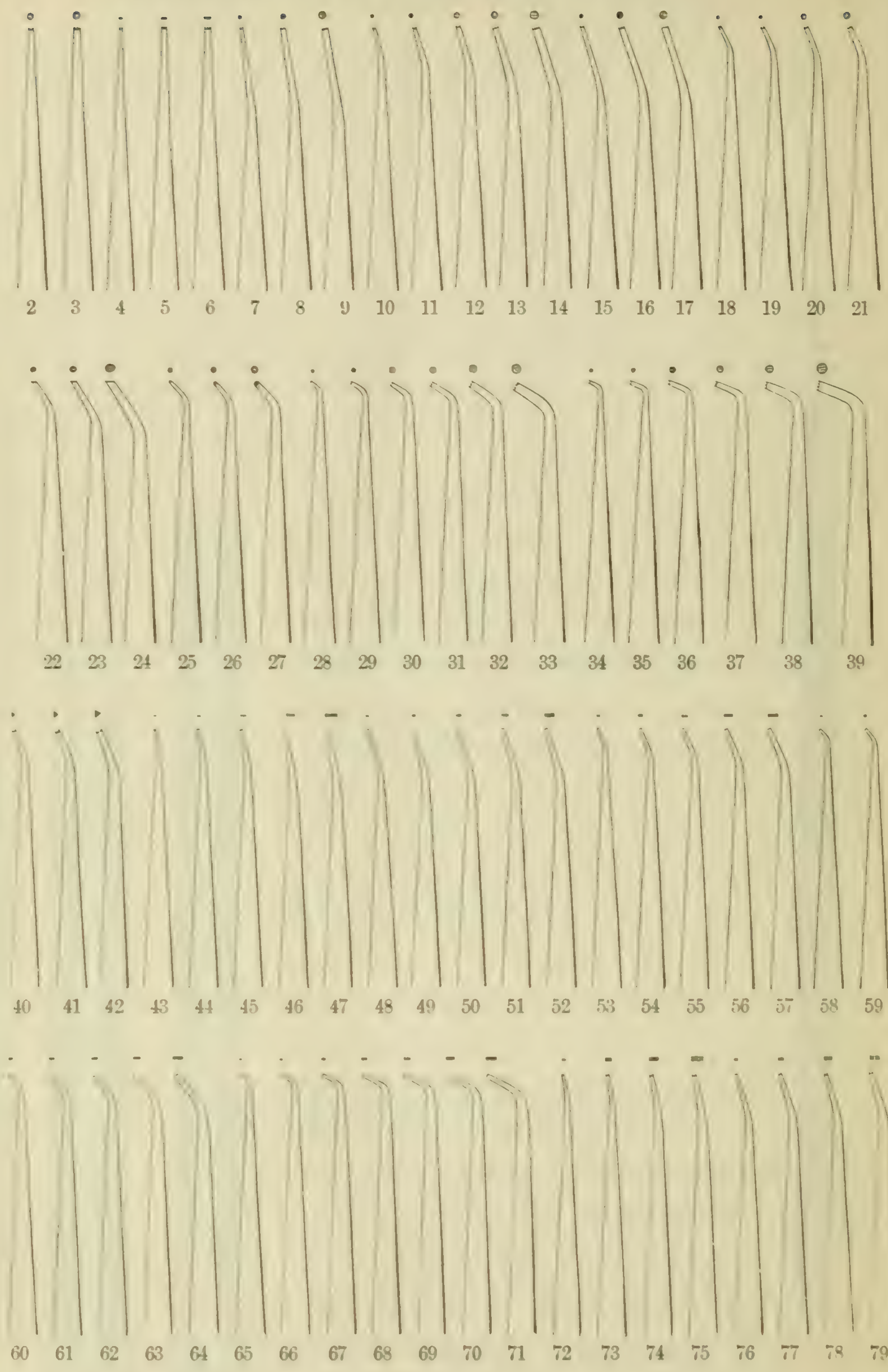
Nerve Probes, three sizes, round handles, Nickel-plated.

Price . . . . per doz. $2.00

Not kept in stock for Cone-Socket Handles.

PLUGGERS.





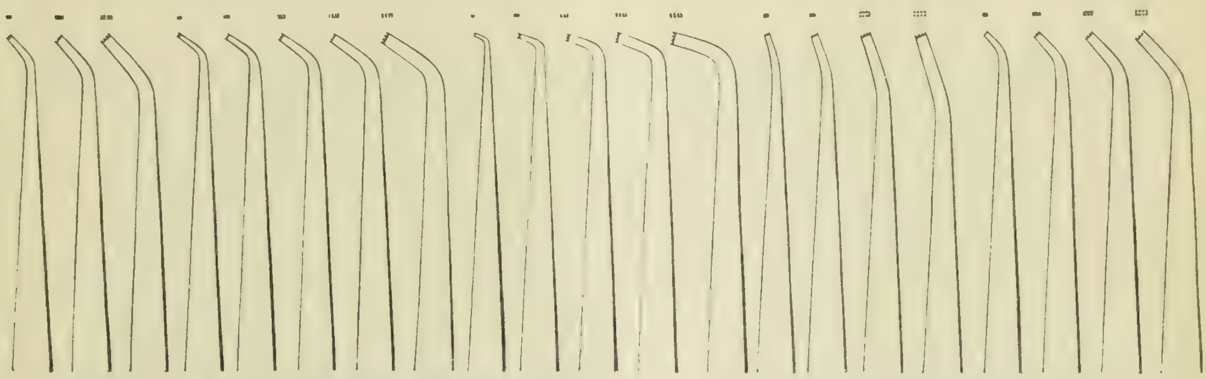
PRICES.

Taper end File-cut Handles, Nickel-plated	each 50 cents.
Cone-Socket Points	" 35 "

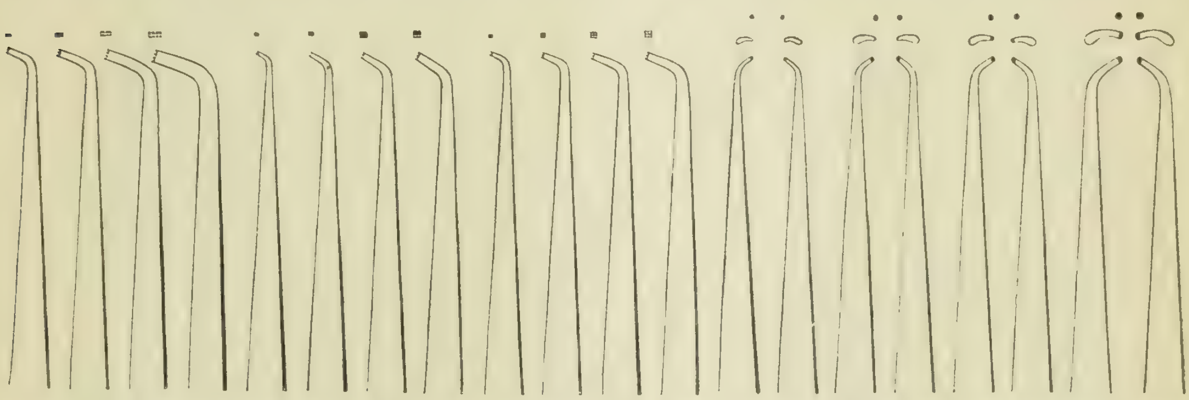
For prices of Cone-Socket Handles see page 8.

PLUGGERS.

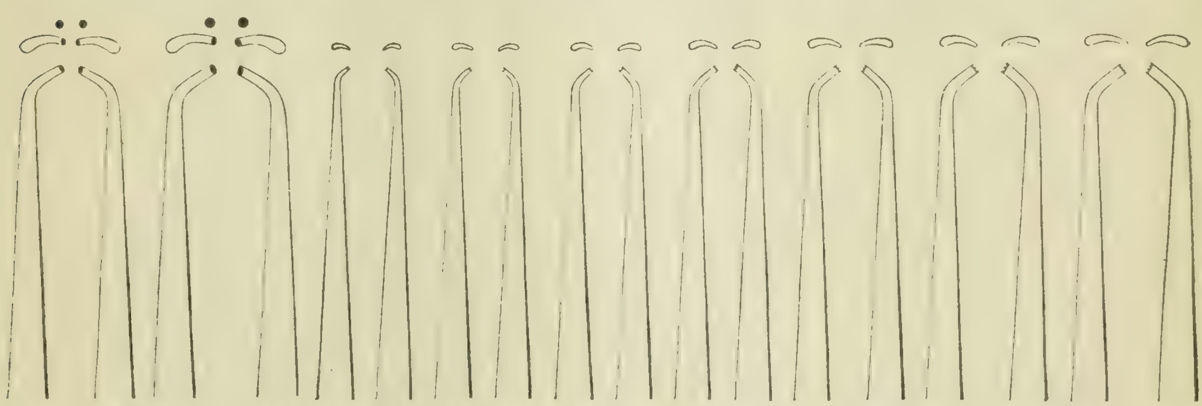
80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99



100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120



121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140



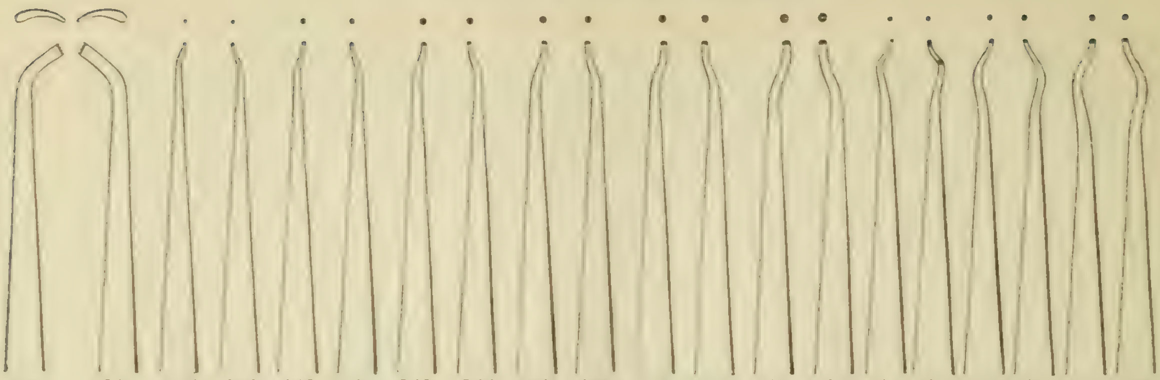
141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158

PRICES.

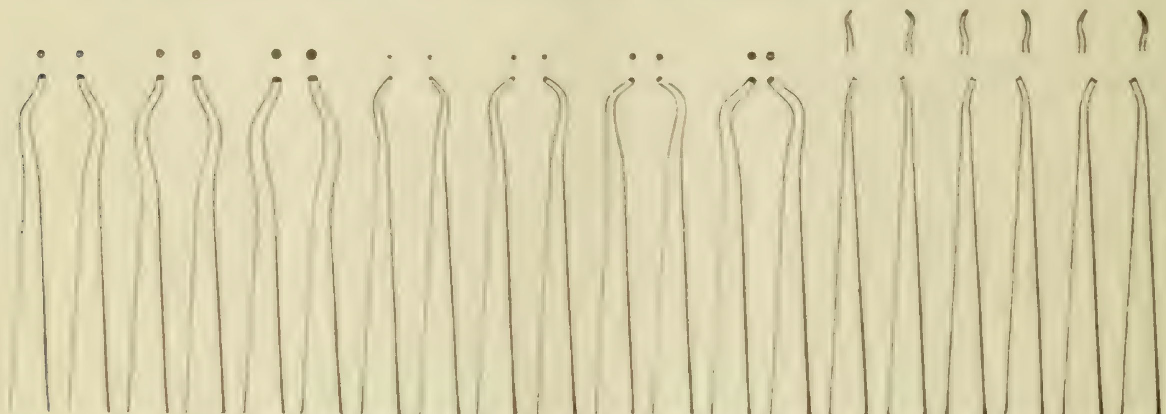
Taper end File-cut Handles, Nickel-plated	.	each 50 cents.
Cone-Socket Points	.	" 35 "

For prices of Cone-Socket Handles see page 8.

PLUGGERS.



159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178



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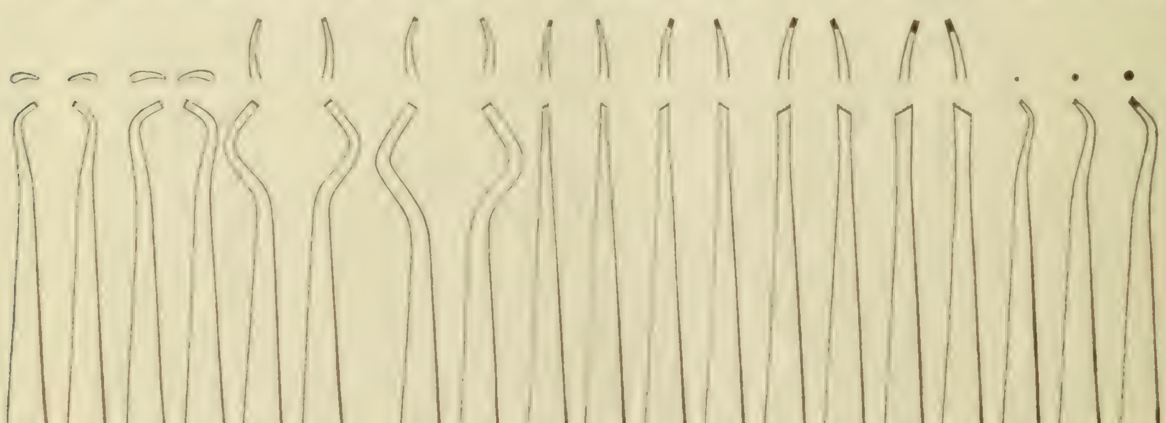
199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218



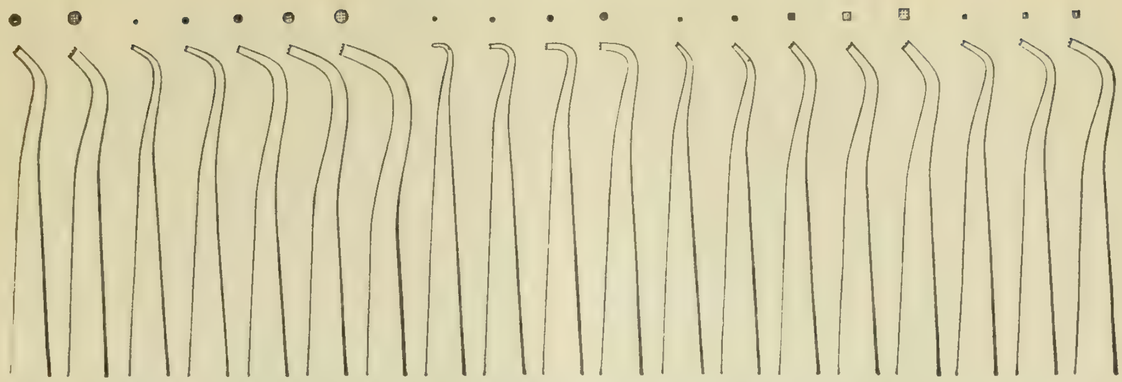
219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237

PRICES.

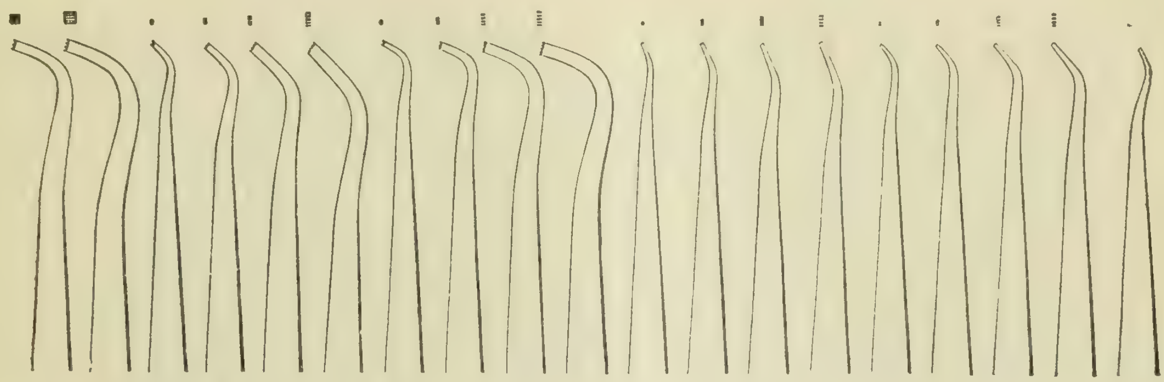
Taper end File-cut Handles, Nickel-plated . . each 50 cents.
Cone-Socket Points . . . . " 35 "

For prices of Cone-Socket Handles see page 8.

PLUGGERS.



238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256



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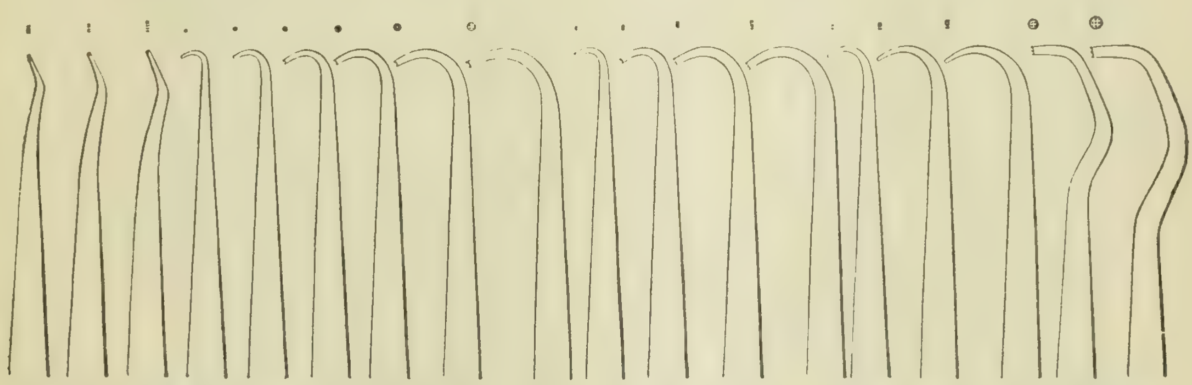

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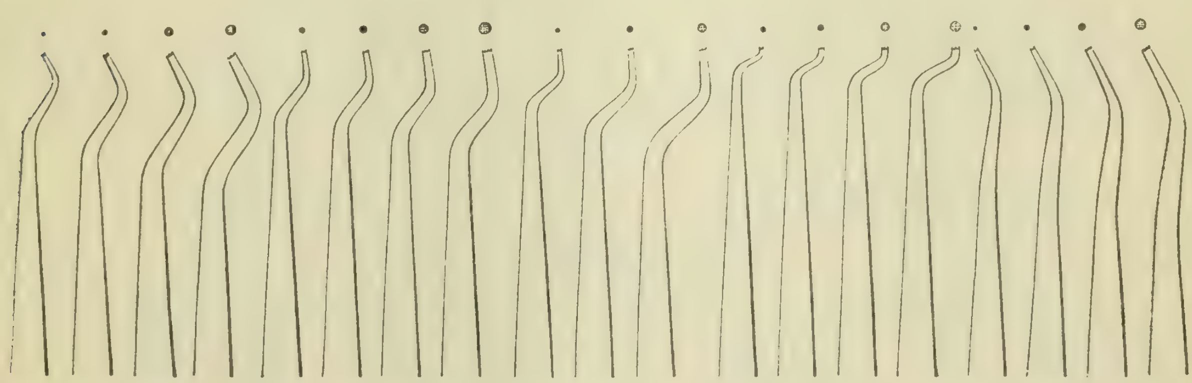


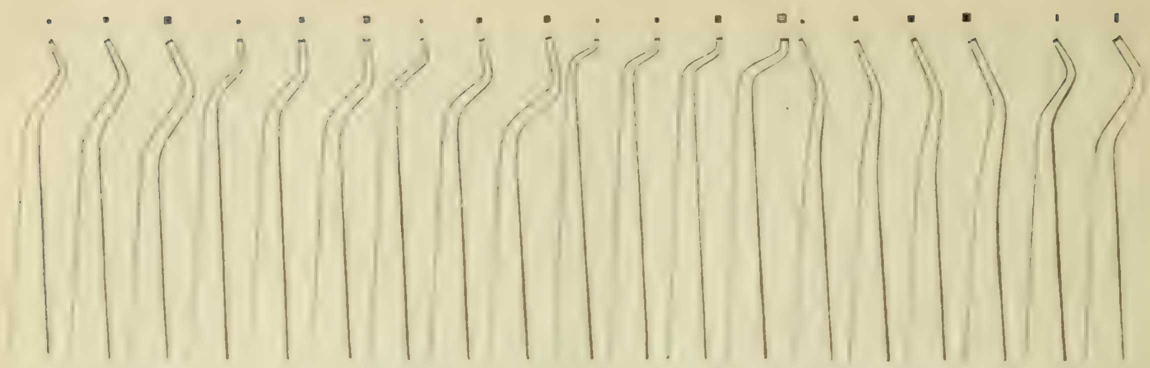
294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312

PRICES.

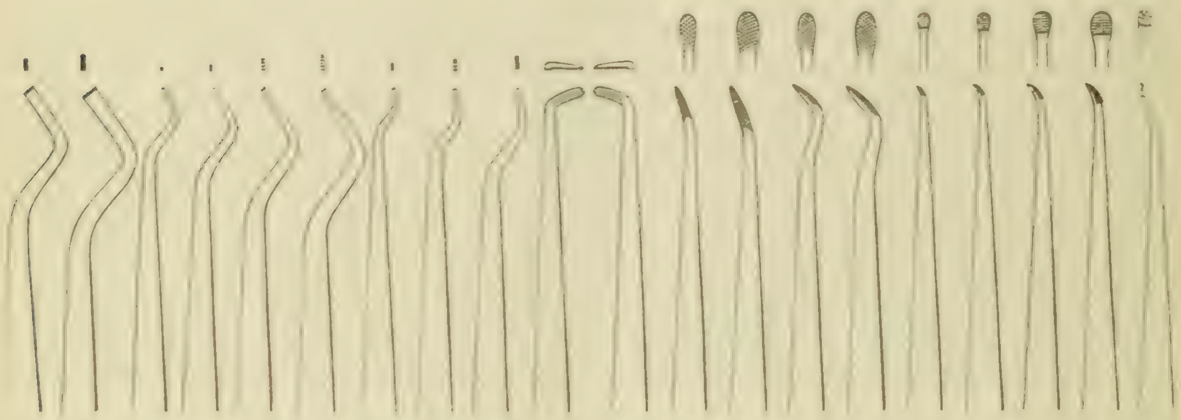
Taper end File-cut Handles, Nickel-plated . . each 50 cents.
Cone-Socket Points . . . . " 35 "

For prices of Cone-Socket Handles see page 8.

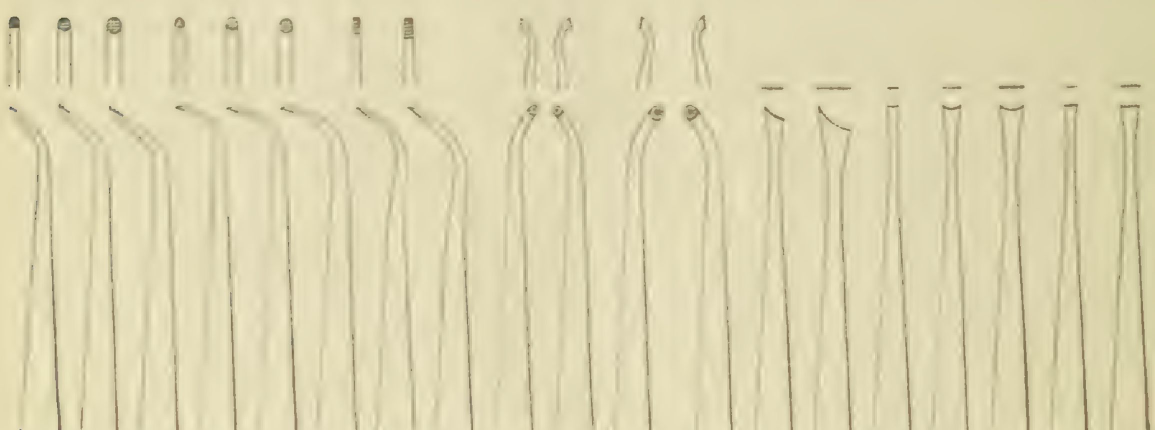
PLUGGERS.



313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331



332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351



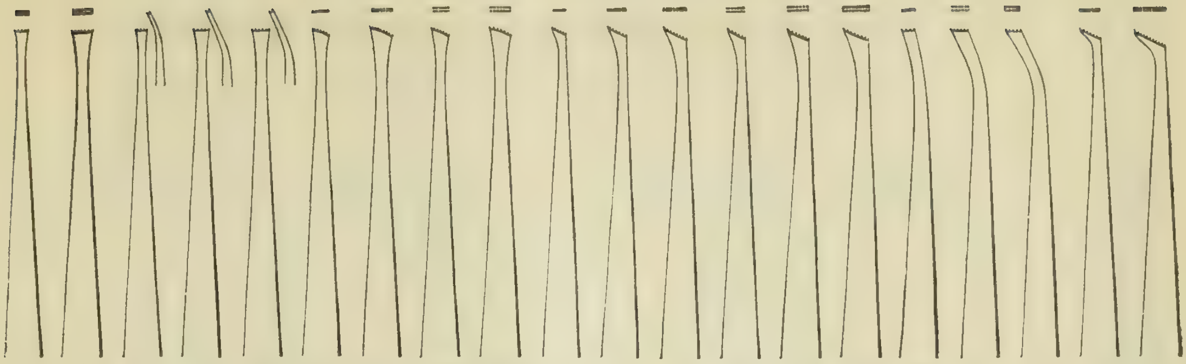
352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370

PRICES.

Taper End File-cut Handles.		Cone-Socket Points.	
Nos. 313 to 342	each $0.50	Nos. 313 to 342 . . .	each 35 cents.
" 343 and 344	" 1.00	" 343 and 344 . .	" 85 "
" 345 and 346	" .75	" 345 and 346 . .	" 60 "
" 347 to 350	" 1.00	" 347 to 350 . . .	" 85 "
No. 351	" .50	No. 351 . . .	" 35 "
Nos. 352 to 359	" .75	Nos. 352 to 359 . . .	" 60 "
" 360 to 370	" .50	" 360 to 370 . . .	" 35 "

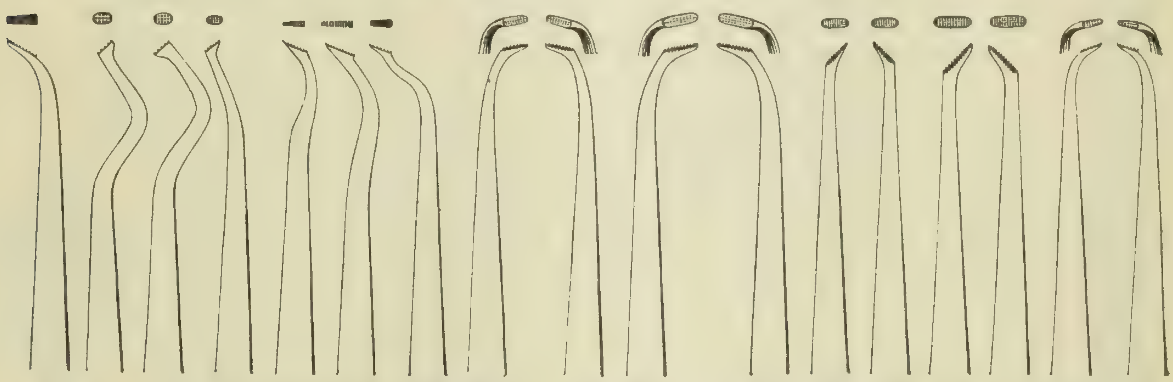
For prices of Cone-Socket Handles see page 8.

PLUGGERS.



371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390

391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409



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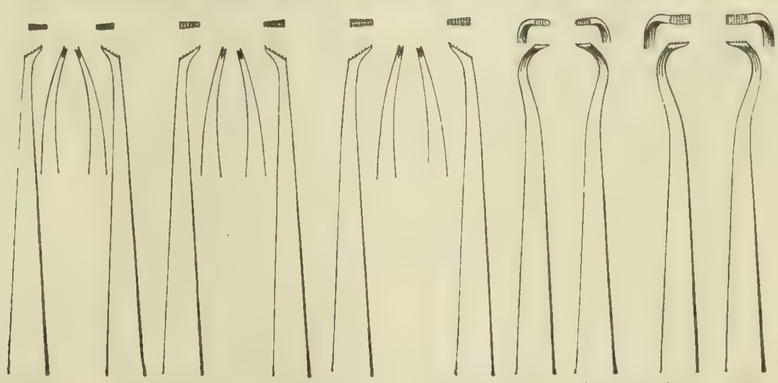


427 428 429 430 431 432 433 434 435 436

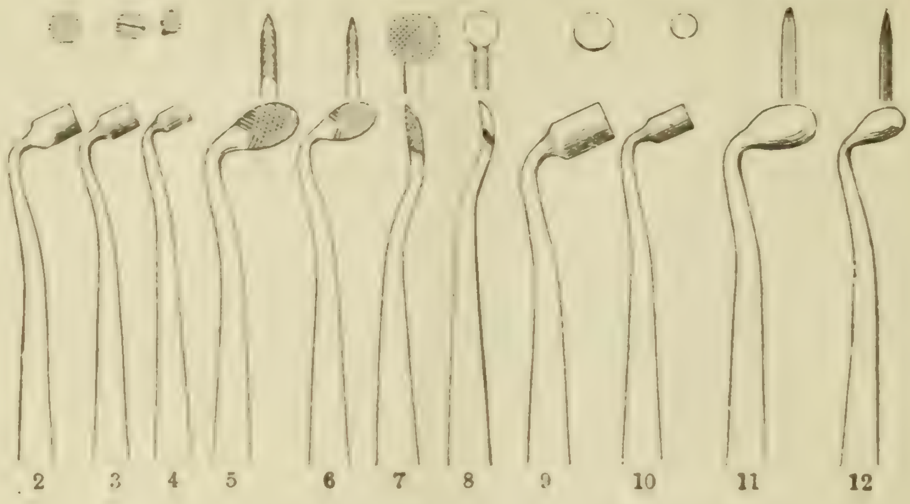
PRICES.

Taper End File-cut Handles.		Cone-Socket Points.	
Nos. 371 to 390 . .	each 50 cents.	Nos. 371 to 390 . .	each 35 cents.
" 391 " 394 . .	" 60 "	" 391 " 394 . .	" 45 "
" 395 " 400 . .	" 75 "	" 395 " 400 . .	" 60 "
" 401 " 405 . .	" 60 "	" 401 " 405 . .	" 45 "
" 406 " 410 . .	" 75 "	" 406 " 410 . .	" 60 "
" 411 " 414 . .	" 60 "	" 411 " 414 . .	" 45 "
" 415 " 426 . .	" 75 "	" 415 " 426 . .	" 60 "
" 427 " 432 . .	" 50 "	" 427 " 432 . .	" 35 "
" 433 " 436 . .	" 75 "	" 433 " 436 . .	" 60 "

For prices of Cone-Socket Handles see page 8.

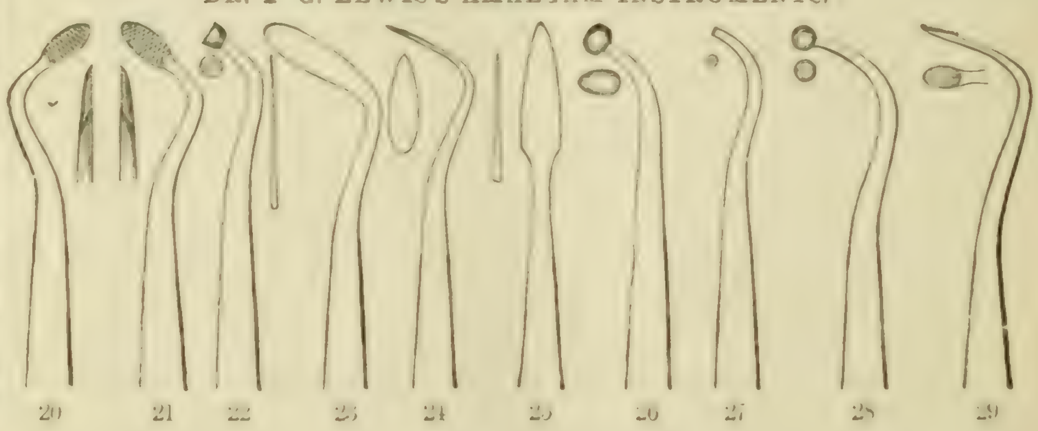
Amalgam, Gutta-Percha, and Plastic Filling Instruments.

Dr. B. F. Arrington's Amalgam Pluggers and Burnishers.



WESTON'S AMALGAM INSTRUMENTS.

DR. T. G. LEWIS'S AMALGAM INSTRUMENTS.



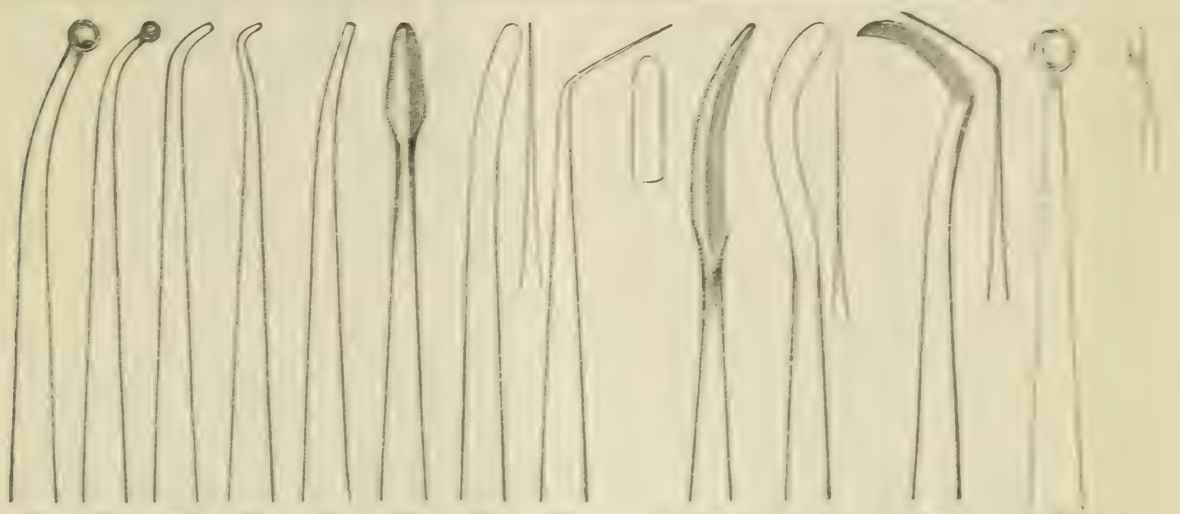
PRICES.

File-cut Handles, Nickel-Plated.		Cone-Socket Points.	
Nos. 1 to 7	each 60 cents.	Nos. 1 to 7	each 45 cents.
" 8 to 12	" 50 "	" 8 to 12	" 35 "
" 13 to 17	" 60 "	" 13 to 17	" 45 "
" 18 and 19 . . .	" 50 "	" 18 and 19 . . .	" 35 "
" 20 to 22	" 60 "	" 20 to 22	" 45 "
" 23 to 28	" 50 "	" 23 to 28	" 35 "
No. 29	" 60 "	No. 29	" 45 "

For prices of Cone-Socket Handles see page 8.

Amalgam, Gutta-Percha, and Plastic Filling Instruments.

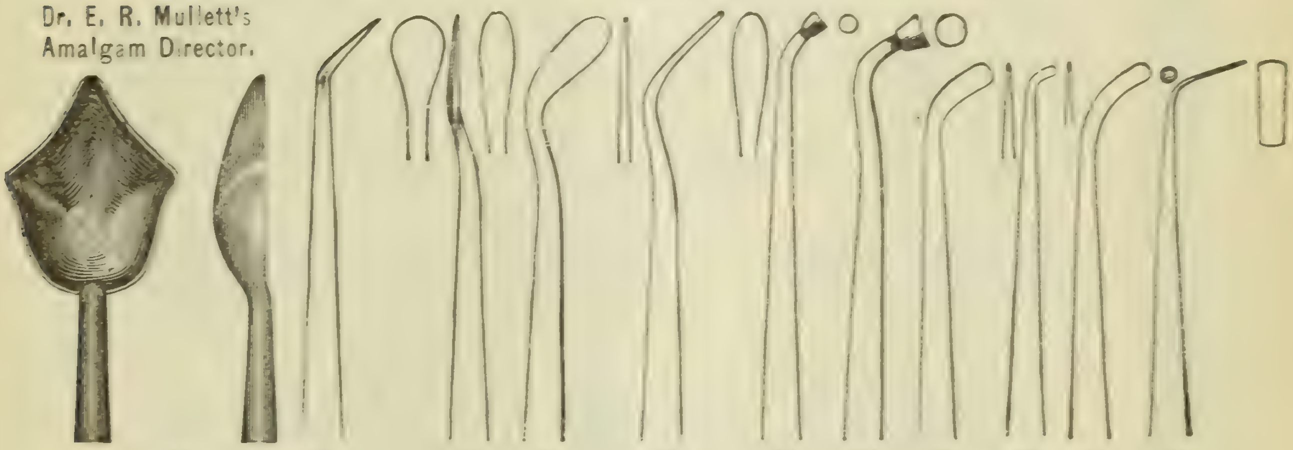
Dr. J. Foster Flagg's Amalgam and Zinc Filling Instruments. — Dr. James B. Willmott's.



30 31 32 33 34 35 36 37 38 39 40 41

Gutta-Percha Instruments.

Dr. E. R. Mullett's Amalgam Director.



42 43 44 45 46 47 48 49 50 51 52

PRICES.

File-cut Handles, Nickel-plated.

Nos. 30 and 31	each	50	cents.
" 32 to 34	"	40	"
No. 35	"	50	"
" 36	"	40	"
Nos. 37 to 41	"	50	"
No. 42 on C. S. Handle Nos. 1 or 2	"	63	"
No. 42 on C. S. Handle No. 11	"	75	"
Nos. 43 to 52	"	50	"

Cone-Socket Points.

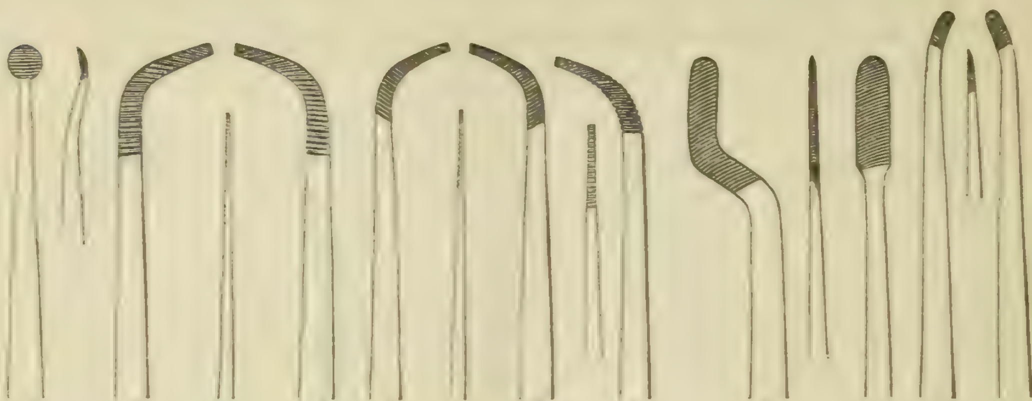
Nos. 30 and 31	each	35	cents.
" 32 to 34	"	25	"
No. 35	"	35	"
" 36	"	25	"
Nos. 37 to 41	"	35	"
No. 42	"	50	"
Nos. 43 to 52	"	35	"

For prices of Cone-Socket Handles see page 8.

PLUG TRIMMERS AND PLUG-FINISHING FILES.

Dr. F. Searle's Plug Trimmers.

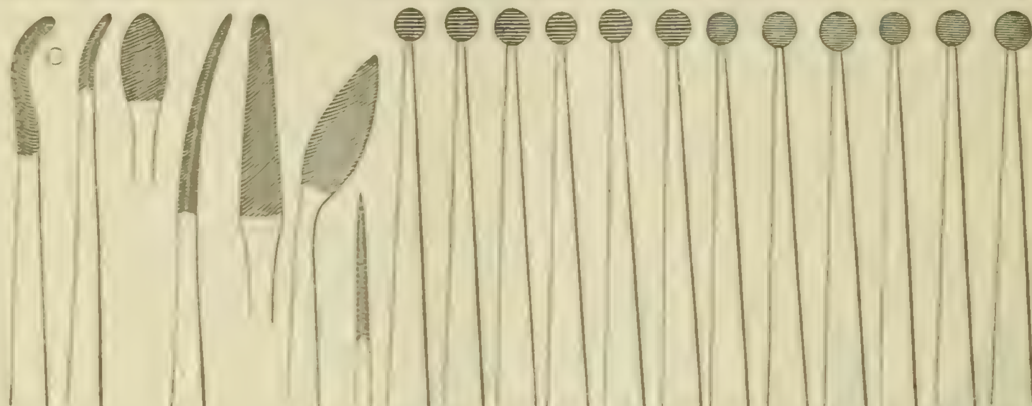
Cut on Rd. side. — R. & L. Cut on one side. — Cut all over. — R. & L. Cut on one side.



2 3 4 5 6 7 8 9 10 11

Dr. Searle's Plug Trimmers. Dr. D. D. Smith's Approximal Trimmers.

Cut all over. — Coarse. Cut one side. — Coarse. Cut both sides. — Fine. Cut one side. — Fine. Cut both sides.



12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

Right and Left Approximal Trimmers.
Patented March 13, 1883.

28 29

Dr. H. Weston's Two-faced Safe-sided File.

30

Dr. M. L. Rhein's Approximal Trimmers.

31 32

No. 31 cut on inside
No. 32 on outside.

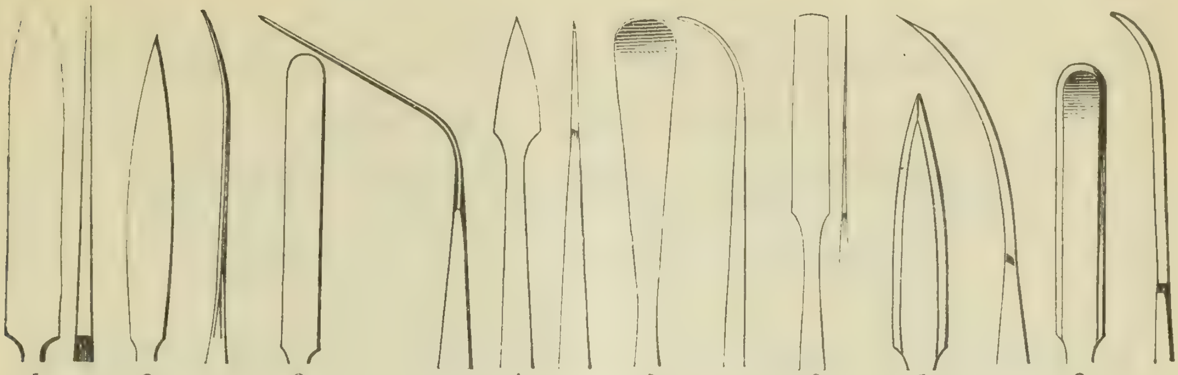
PRICES.

Octagon Handles, Nickel-plated.			Cone-Socket Points.		
Nos.	1 to 6	each $0.40	Nos.	1 to 6	each $0.25
"	7 " 9	" .50	"	7 " 9	" .35
"	10 and 11	" .40	"	10 and 11	" .25
"	12 to 18	" .50	"	12 to 18	" .35
"	19 " 24	" .60	"	19 " 24	" .45
"	25 " 27	" .75	"	25 " 27	" .60
"	28 and 29	" .50	"	28 and 29	" .35
No.	30	" .75	No.	30	" .60
Nos.	31 and 32	" .60	Nos.	31 and 32	" .45

For prices of Cone-Socket Handles see page 8.

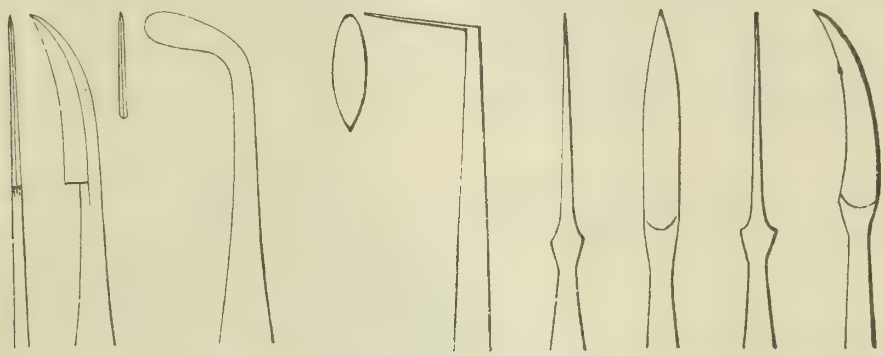
SPATULAS, WAX KNIVES, AND LANCETS.

SPATULAS. WAX KNIVES.



1 2 3 4 5 6 1 2

LANCETS.



1 2 3 4 5

SPATULAS AND WAX KNIVES.

For Cone-Socket Handles . . . . each 25 cents.

These forms are made on various styles of long handles, mostly double-ended.

LANCETS.

For Cone-Socket Handles . . . . each 35 cents.

These forms are made on various styles of long handles,—viz, Steel, Ebony, and Ivory.

PAPER AND CLOTH STRIPS.

IN THE FOLLOWING VARIETIES:

CUTTLE-FISH PAPER STRIPS.

FRENCH EMERY-PAPER STRIPS.

EMERY-CLOTH STRIPS.

CROCUS-CLOTH STRIPS.

Put up in sliding-form boxes, each containing one gross Strips.

Per box (one gross) any variety . . 50 cents.

In addition to the above we have also our well-known fine Linen Tapes, mounted with various powders, put up in packages containing twelve 2-yard rolls, each package incased in a box, viz:

BUCK-HORN TAPE,

CORUNDUM TAPE,

SILEX TAPE.

Price, either variety	per roll, 2 yds.	$0.08
" " "	per doz. rolls	.84

Reduction in Price of Instruments.

Octagon Bronzed Handle Excavators, Burs, and Drills, formerly $2.70 per dozen,

REDUCED to $2.40 PER DOZEN.

REDUCTIONS IN PRICES OF NITROUS OXIDE GAS AND CYLINDERS.

From and after August 1, 1888, until further notice, the prices of our Gas Cylinders will be as follows:

100 gallon Cylinders	each $6.00
500 " "	" 15.00

These reductions, with the recent cut in Nitrous Oxide, will make the prices of Cylinders, filled and refilled, as follows:

Cylinder, with 100 gallons of Gas . .	$8.00
" " 500 " " . .	25.00
Refilling 100-gallon Cylinder . . .	2.00
" 500 " " . . .	10.00

Reduction in Price of Fused Nitrate of Ammonia.

We have reduced the price of Fused Nitrate of Ammonia to the price quoted below.

This Nitrate of Ammonia is made in our own manufactory, and we therefore know what we are saying when we recommend it as of the best quality obtainable. The Nitrous Oxide which we sell is made from it.

Put up in 5, 10, 25, 50, and 100 pound boxes. Price fluctuates.

Present price, per pound, including boxing . . . 24 cents.

AGATE CEMENT.

REDUCTION IN PRICE.

This Cement does not owe its hardness to alum or its equivalent in any form, or to any component which is liable to be dissolved out in the fluids of the mouth.

EXPERIENCE HAS DEMONSTRATED THAT

The Agate Cement is superior to all others in Strength, Density, Freedom from liability to Flake or Disintegrate in the Mouth, and especially in its Perfect Uniformity.

It possesses also a certain putty-like quality, which renders it easier of manipulation than other Cements.

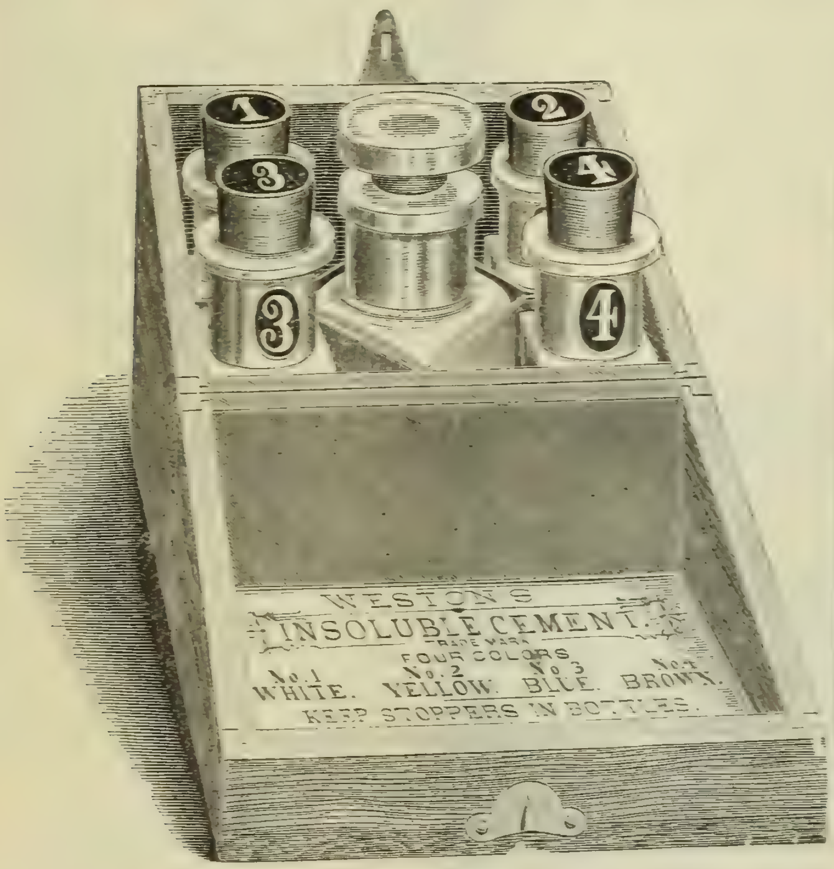
Put up in boxes containing ounce and half-ounce.

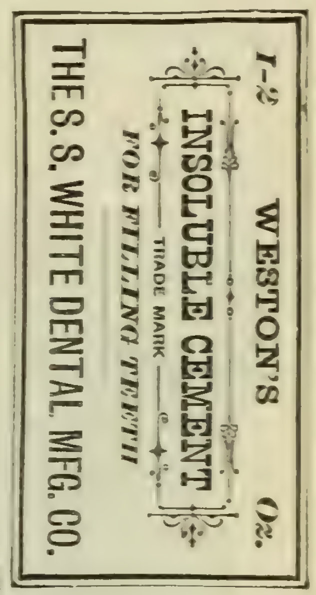
Full directions accompany each package.

Reduced Price	per oz. $1.00
" "	per ½-oz. .75

WESTON'S INSOLUBLE CEMENT.

The hydraulic properties of this Cement have been demonstrated by careful experiments out of the mouth and in the practice of those most accustomed to its use. In fact, the best results are obtained when the filling, immediately after its introduction into the tooth, is submerged in water as hot as can be borne in the mouth, and this continued from three to five minutes. Approximately the same results are produced by the rapid drying of the filling with hot air,—heat, either wet or dry, hastening the hardening of the material and securing strength and durability. When used as a capping for exposed pulps, or for attaching porcelain crowns, this Cement may be hardened in two minutes with hot air or hot water, which at the same time prevents all acid reaction. When the hardening is hastened either by the hot-air syringe or by the use of hot water, varnishing the filling may be dispensed with. **Directions accompany each package.**





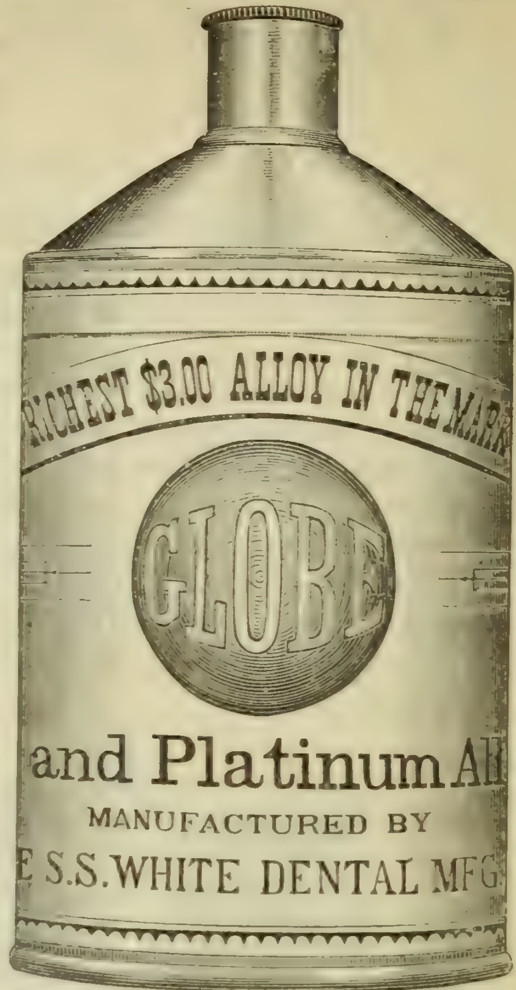
The powder for this extremely hard and durable Cement is now supplied in colors which, used separately *or combined artistically*, will enable the dentist to imitate the shade of the tooth to be filled. Some degree of practice will be requisite for the production of a close resemblance, and it is important to observe that a *shade darker* than the tooth is less noticeable than a lighter shade.

The colors are contained in quarter-ounce bottles, No. 1 White, No. 2 Yellow, No. 3 Blue, and No. 4 Brown. The ounce fluid bottle has a stem extension of the ground-glass stopper that serves as a convenient dropper.

Price, four-color package	$2.25
" half-ounce (one color) package	1.50

ARRINGTON'S AND GLOBE ALLOY IN TIN FLASKS.

Quantity rates have so increased the sales in 4-oz. lots of these two leading Alloys as to make it desirable to use a less bulky and more convenient package than heretofore. We have therefore adapted the Tin Flask shown to the purpose. It is oval in shape and has a screw top. Its principal advantage over envelopes is its greater convenience and greater security in the transportation of the Alloy in the mails. For smaller quantities the envelopes are still used.



PRICES.

Globe Alloy . . .	per oz.	$3.00
" . .	two-oz. lot	5.50
" . .	four-oz. lot	10.00
Arrington's Amalgam, less than four oz.	per oz.	2.50
Arrington's Amalgam, more than four oz. and less than ten oz.	per oz.	2.25
Arrington's Amalgam, ten oz. or more	per oz.	2.00

Smith's Adamantine Phosphate Cement.

INSOLUBLE.

TWO COLORS.

Price - - $1.00

Also in Cedar Cases, as shown in cut, containing four colors of Powder and one bottle of Liquid, glass-stoppered.

A, White; B, Brown; C, Yellow; D, Bluish.

Price - - $2.00

Smith's Oxychloride of Zinc.

PRICES.

Plain Form, one ounce	each	$1.00
Cedar Cases, as shown in cut, containing four colors of Powder and one bottle of Liquid, glass-stoppered	"	2.00

A, White; B, Brown; C, Yellow; D, Bluish.

TRADE

MARK.

Our Trade-Mark SS was copyrighted under the old regulations in the United States District Court for the Eastern District of Pennsylvania, twenty years ago, and it would remain, by the fact of its long use, under the protection of the common law, without further safeguard: but for complete security and to comply with recent statutes, we have had it registered in the United States Patent Office, where it stands on record as No. 15,474, of date May 15, 1888, for the term of thirty years.

We have also registered the trade-mark in the British Patent Office.

In both cases it covers all goods of our manufacture.

THE S. S. WHITE DENTAL MFG. CO.

COFFER-DAM RUBBER.

WE KEEP BUT ONE GRADE—THE BEST. FULL WIDTH—35 INCHES.

There are Rubber-Dams and Rubber-Dams,—good, bad, and indifferent. The good should be used by everyone, the bad by no one, and the indifferent by those only who don't know where to get better. We have already told our experience with this last, but it will bear repetition.

We have always kept the best that could be had, but a year or two ago we purchased a quantity of the kind sold by others at what were termed "popular prices." It was not by any means equal to our regular stock, either in quality or quantity. We sold it at the "popular prices," always with the distinct statement that it was not the best quality, but what we termed "inferior." We did not handle it long. In a very little while we became satisfied that it was no exception to the rule that inferior goods are not satisfactory, and we discarded it.

Then our effort was to get a Rubber that while equal to our best in quality could be sold in competition with the popular prices, and we succeeded. For the only Dam we now sell we can confidently claim the best quality, and, what is of almost equal importance to the purchaser, it is full width,—35 inches. Compare it with some of that sold by others at the same prices and tell us what you find.

PRICES.

Thin	per yard	$1.00
Medium	"	1.50
Thick	"	2.00

COFFER-DAM RUBBER IN BOXES.

Form of Package suggested by Dr. B. H. Teague.

Put up in boxes containing one yard 35-inch wide Dam, cut into 48 pieces 6x4$\frac{3}{4}$ inches,—a very convenient size for most operations. The dam is placed between layers of blotting-paper, which, it is claimed, protect it from the deleterious action of the atmosphere, thus preserving its quality and durability.

Price, Thin	per box	$1.25
" Medium	"	1.75
" Thick	"	2.25

CHART OF PLAIN TEETH.

Flat, Upper, Incisors and Cuspids.

Each Cut represents the Half of a Set of Six.

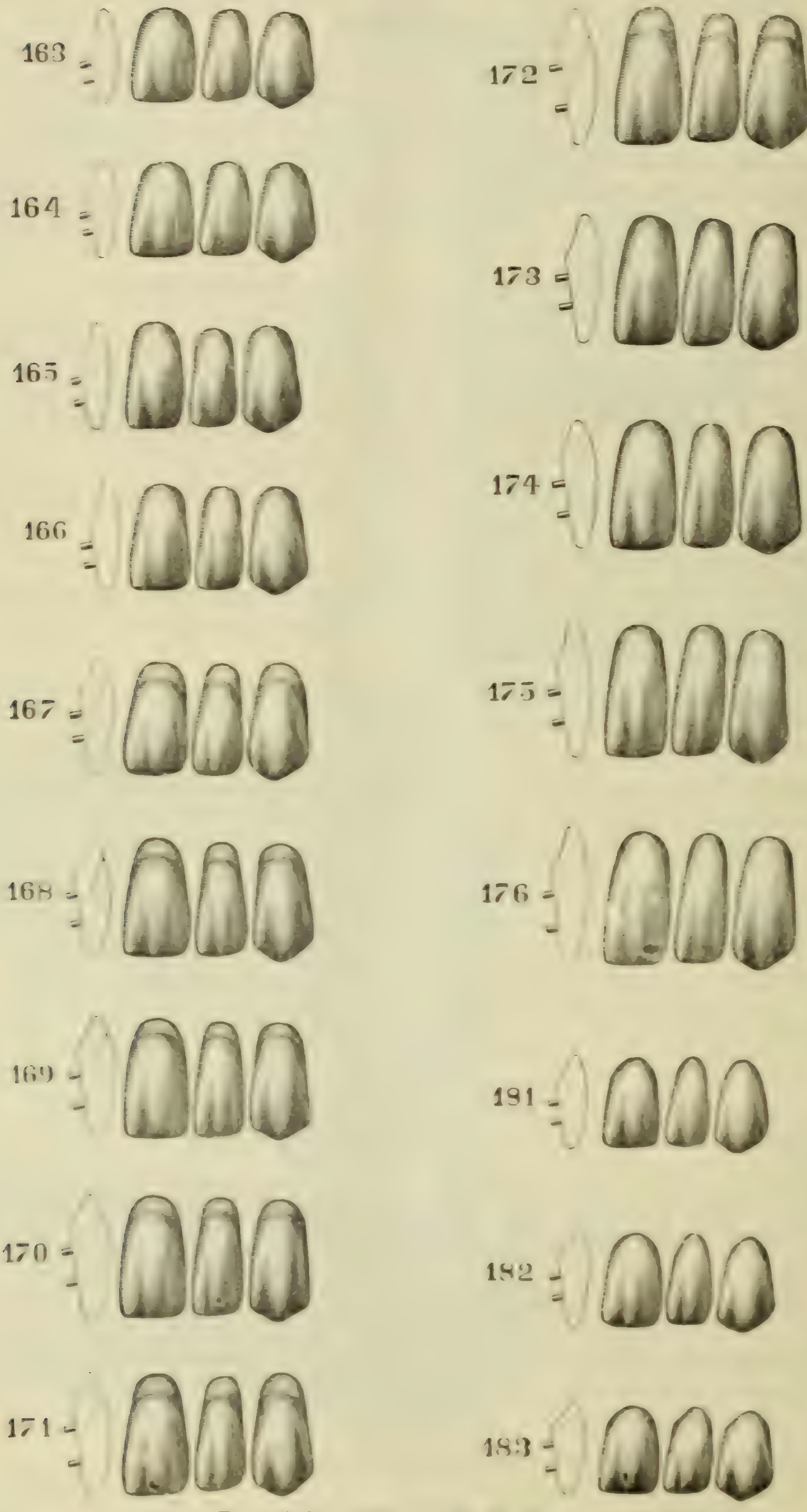


CHART OF PLAIN TEETH.

Flat, Upper, Incisors and Cuspids.

Each Cut represents the Half of a Set of Six.

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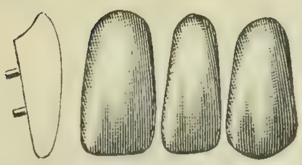

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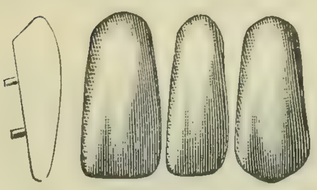

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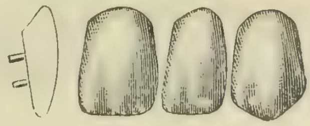

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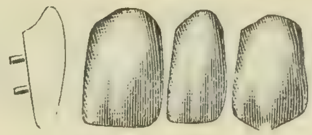

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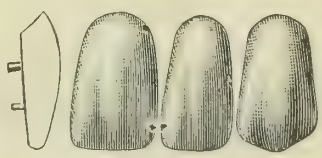

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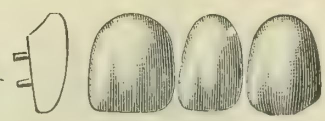

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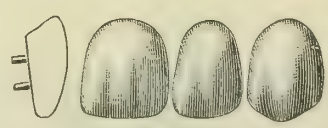

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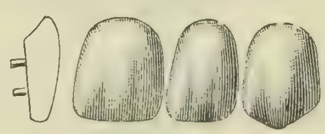

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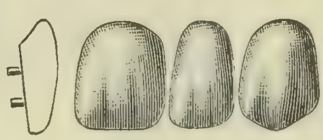

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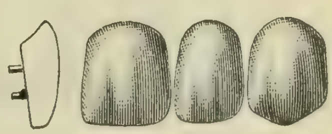

CHART OF PLAIN TEETH.

Flat, Upper, Incisors and Cuspids.

Each Cut represents the Half of a Set of Six.

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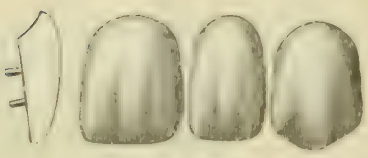

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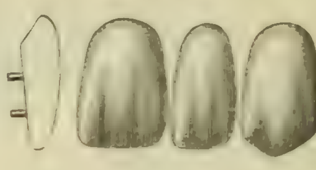

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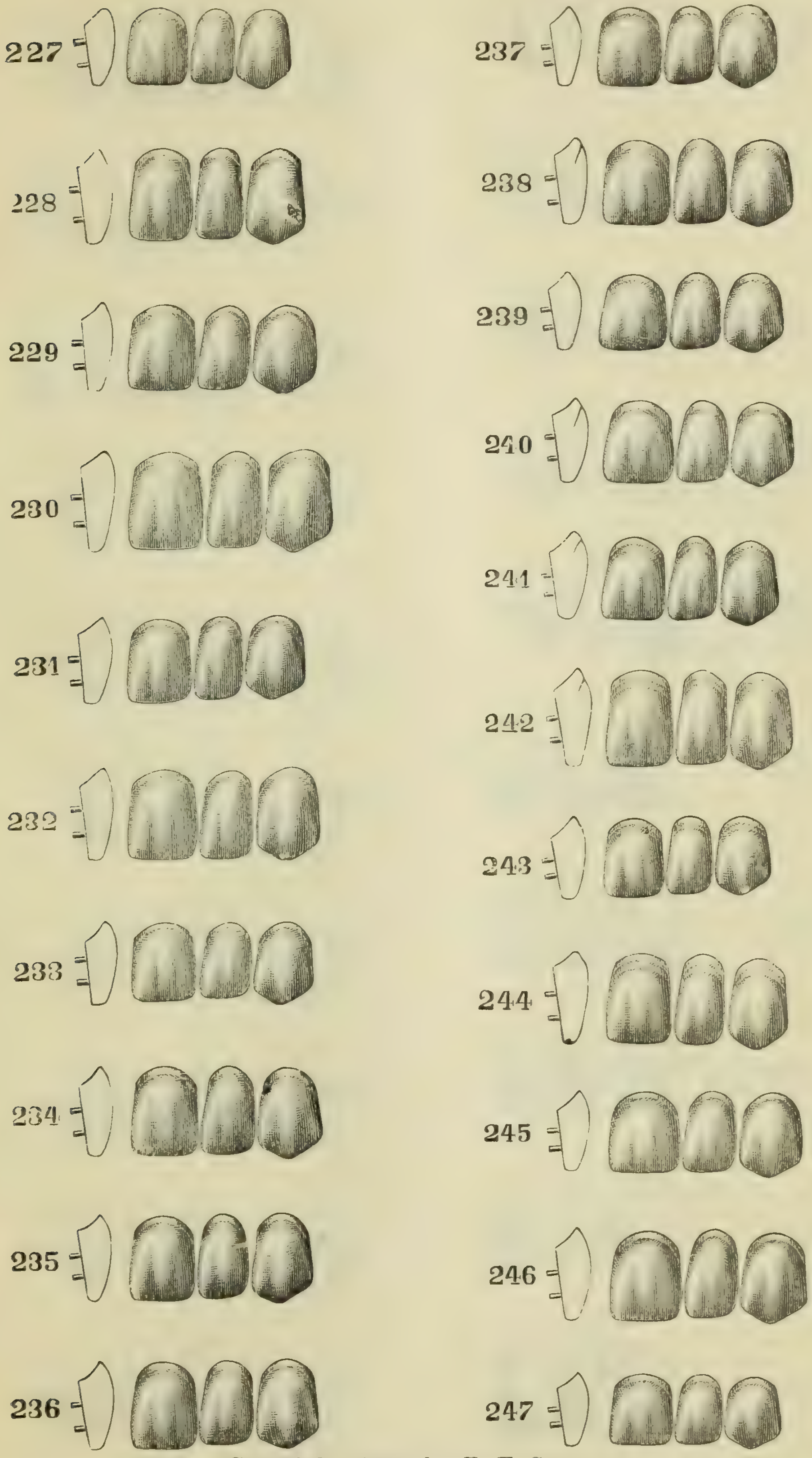

CHART OF PLAIN TEETH.

Flat, Upper, Incisors and Cuspids.

Each Cut represents the Half of a Set of Six.

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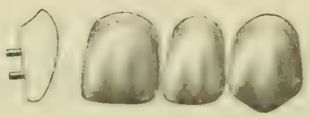
250 

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CHART OF PLAIN TEETH.

Flat, Upper, Incisors and Cuspids.

Each Cut represents the Half of a Set of Six.

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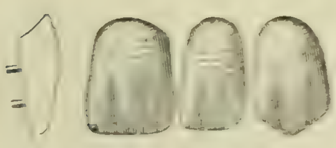

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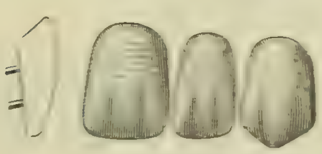

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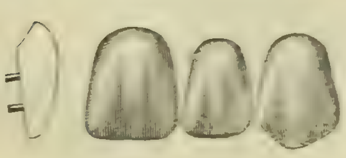

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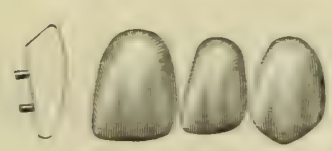

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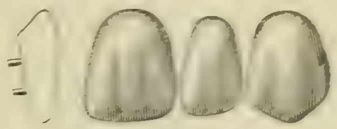

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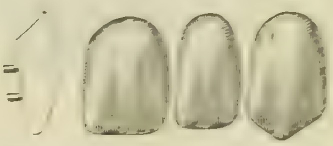

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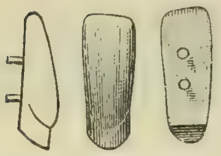
CHART OF PLAIN TEETH.

Flat, Lower, Incisors and Cuspids.

Each Cut represents the Half of a Set of Six.



The above cuts show the front and back of an inferior Flat Tooth; the side view giving the position of the pins and the curve of the lingual face of a central tooth.

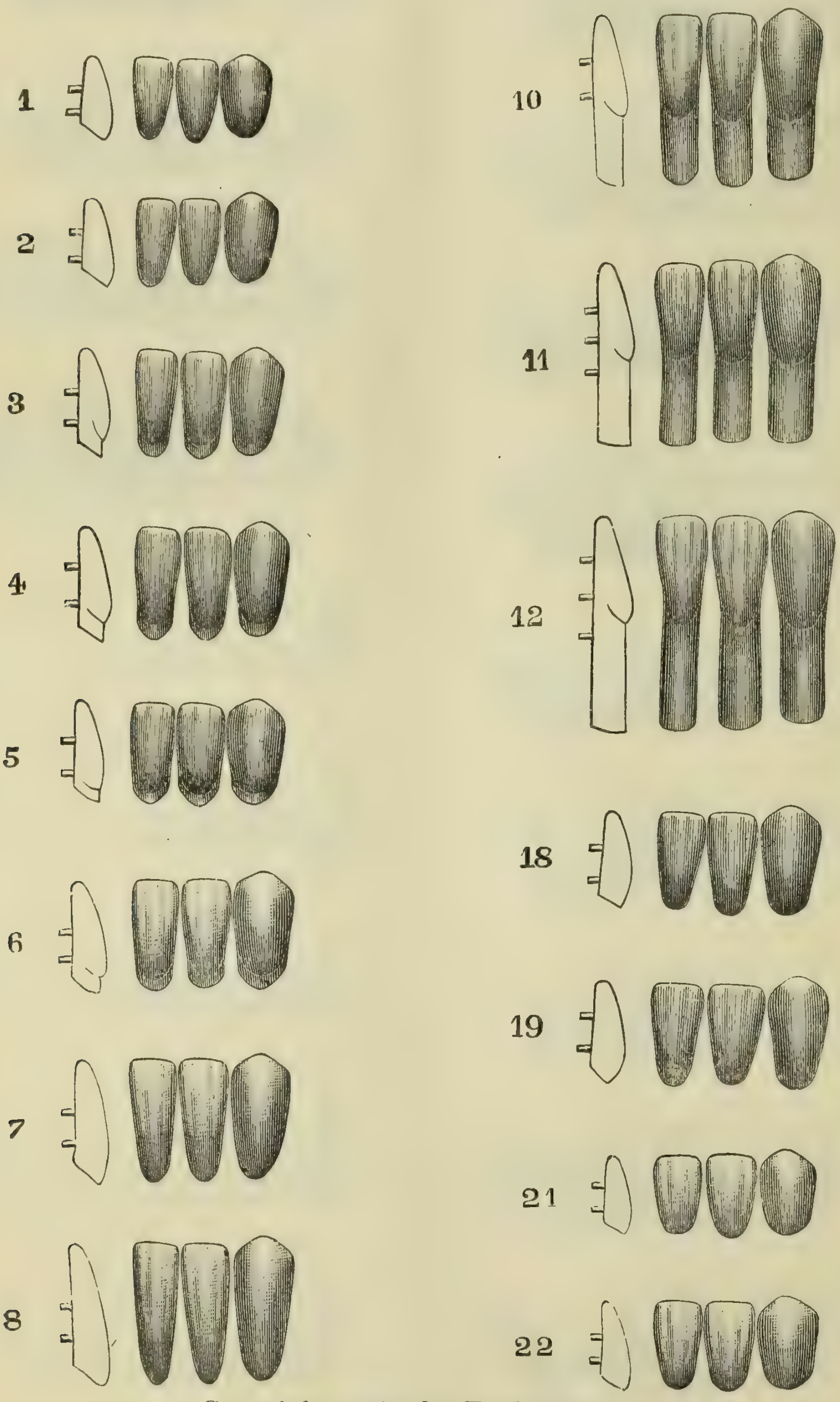


CHART OF PLAIN TEETH.

Flat, Lower, Incisors and Cuspids.

Each Cut represents the Half of a Set of Six.

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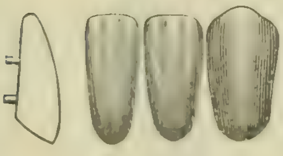
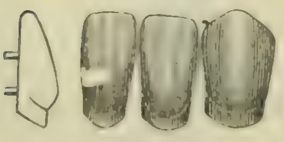
29 

30 

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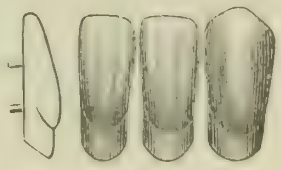
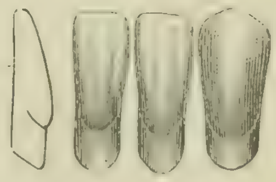
34 

35 

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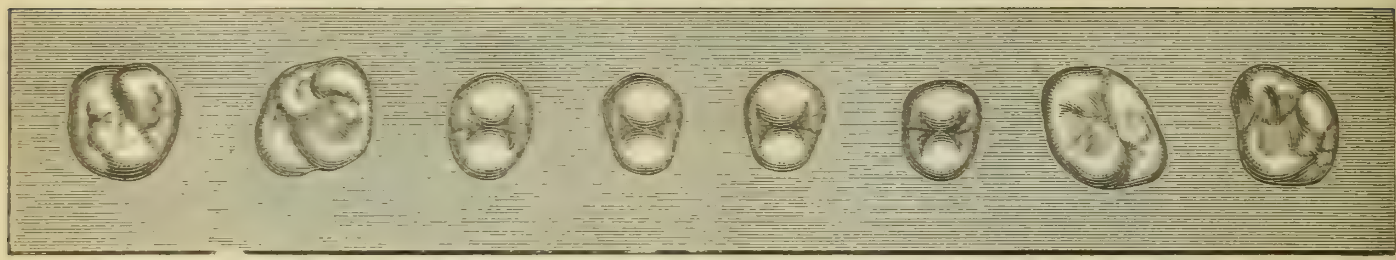
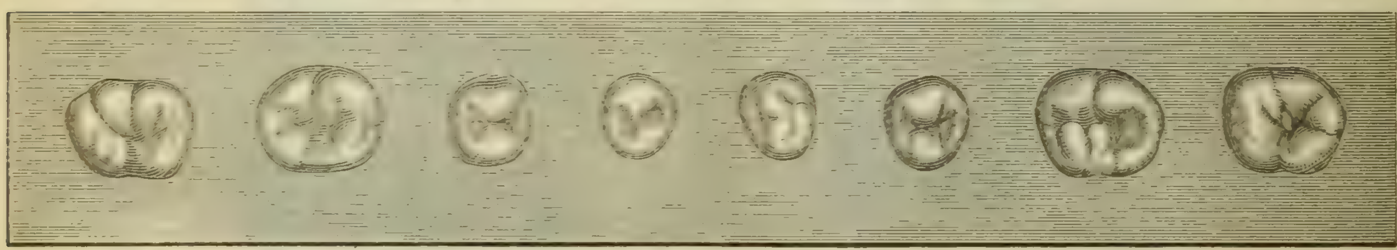
Solid Gold Cusps for Crown and Bridge-Work.

RIGHT. UPPER. LEFT.



THICKNESS OF THE GOLD CUSPS.

1	2	3	4	5	6	7	8
$3.50.	$3.50.	$2 50.	$2 00.	$2.00.	$2.00.	$3.50.	$3.50.



16	15	14	13	12	11	10	9
$3.00.	$3.50.	$2.00.	$2.00.	$2 00.	$2.00.	$3.50.	$3.00.

LEFT. LOWER. RIGHT.

These solid Cusps are made of 22-carat gold, and are designed to be soldered to seamless or other gold bands fitted to the natural tooth-roots in the mouth. The Cusps are also intended to form the masticating surfaces of porcelain crowns in bridge-work.

Endless Packings for Vulcanizers.

The principal advantage of the Endless Packings for Vulcanizers is that special sizes are made for the various Vulcanizers for which they are intended, so that their use saves the time and trouble of fitting.

PRICES.

Endless Packings for Mann Vulcanizers	each, 12 cents.
" " Whitney "	" 8 "
" " Hayes "	" 10 "

We have also the Strip Packings at the following

PRICES.

Strip Packings for Mann Vulcanizers	each, 10 cents.
" " Whitney "	" 5 "
" " Hayes "	" 8 "

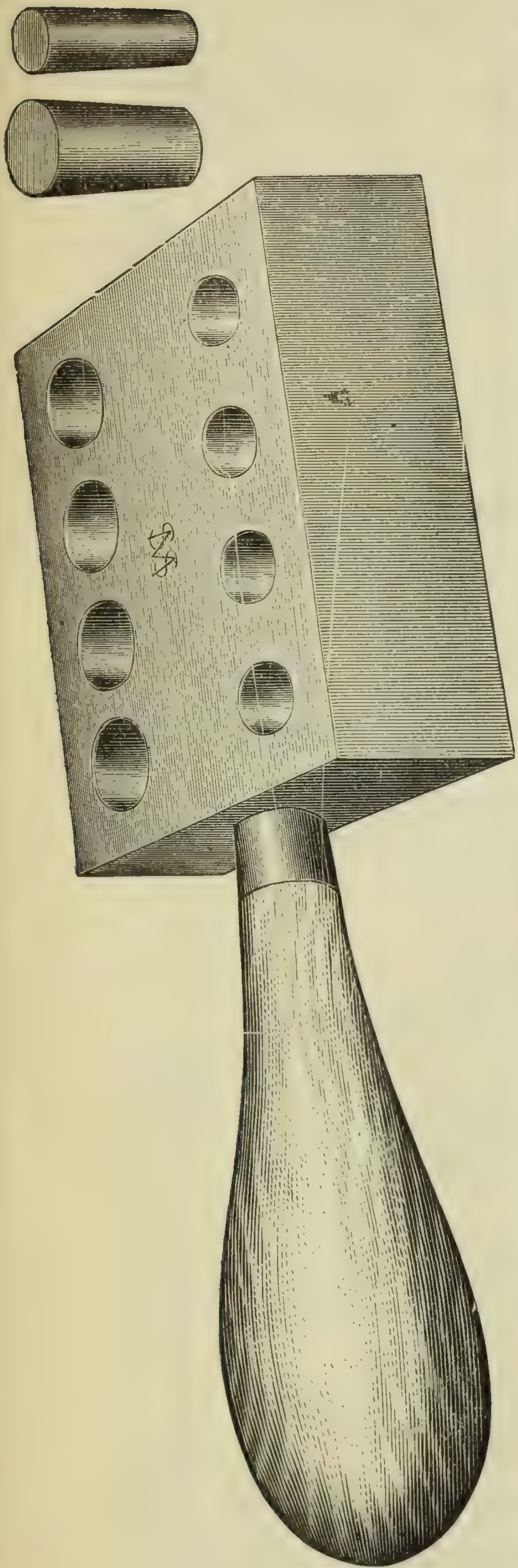
ALL-PORCELAIN BRIDGE-WORK.

System of Dr. E. PARMLY BROWN,

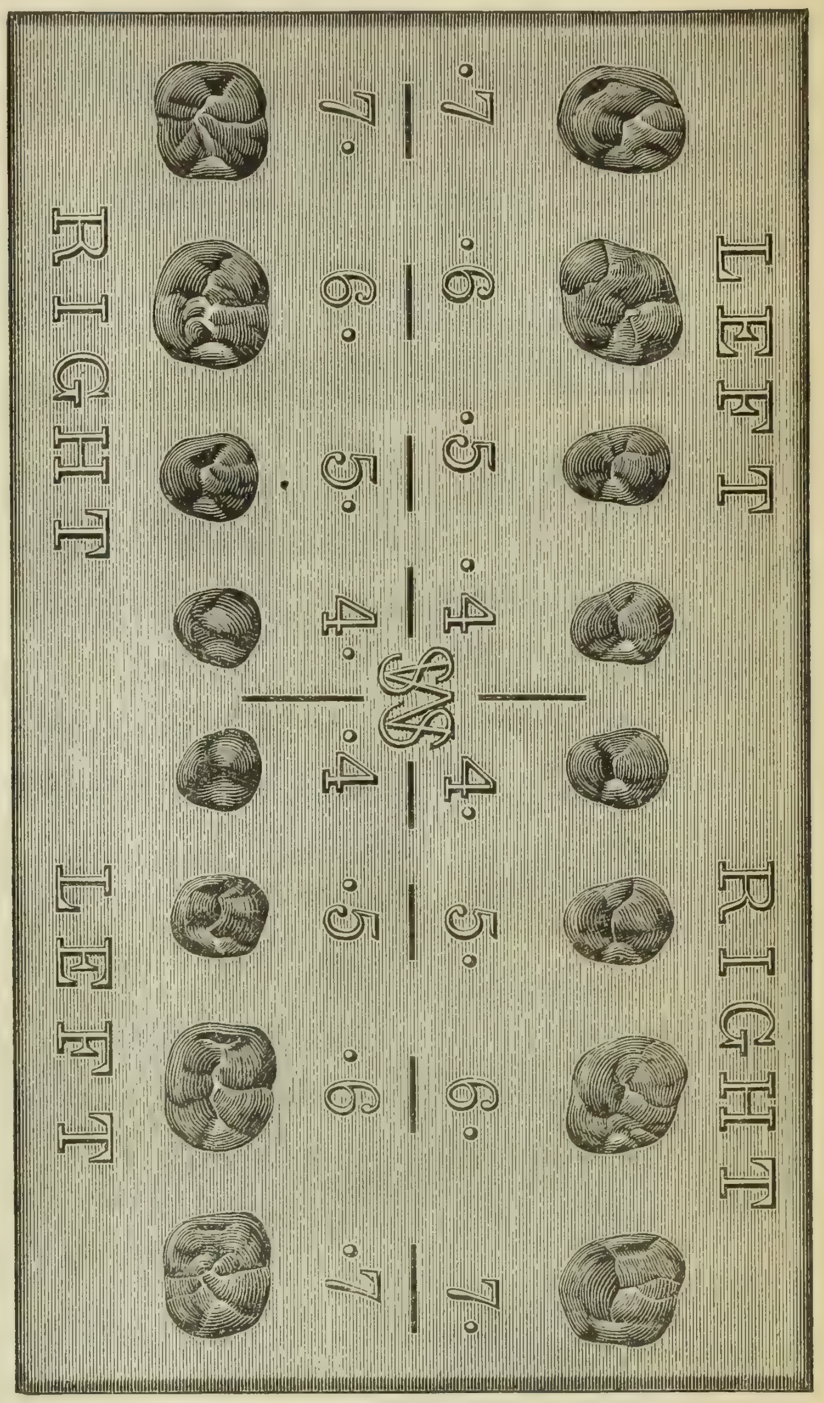
FLUSHING, N. Y.

Private instruction is given in the methods of construction and insertion of All-Porcelain Bridges (in connection with general principles of practice) by the inventor, who inserts cases for patients of other dentists on equitable terms; he also makes cases on models ready for insertion at $3.00 to $5.00 per tooth.

Die-Plate and Hub-Mold for making Cap-Crowns.



Hub-Mold.



Die-Plate.

These inventions were described in the DENTAL COSMOS for August, 1887, pages 482 to 485. This description also accompanies each Die-Plate.

The Die-Plate is made of a special hard alloy and the Hub-Mold of cast-iron.

PRICES.

Die-Plate	$5.00
Hub-Mold	1.00

SECOND-HAND CHAIRS, ENGINES, ETC., FOR SALE.

AT THE PHILADELPHIA DEPOT.

1	Harris Chair, Maroon Plush. Never used	$100.00
1	Physician's Operating Chair, Plush. Nearly new	50.00
1	Morrison Chair, Maroon Plush	75 00
1	S. S. White No. 1 Chair, Green Plush, with Footstool	35.00
1	Electro-Dynamic Battery and Motor	30.00
1	Bonwill Engine and Hand-piece	30.00
2	Johnston Engines, with No. 2 Cone-Journal Hand-pieces . each	25.00
1	Suspension Engine, No. 6 Hand-piece, without Crane	38 00
1	Pedal-Lever Chair, Maroon Plush, good condition	120.00
1	Electro-Dyamic Battery and Motor	25.00
1	New Mode Heater, Less Heating Appliances	16.00

AT THE NEW YORK DEPOT.

1	Harris Chair, Medium Base, Maroon Plush, New, Reduced from $180.00 to	$100.00
1	S. S. White Pedal-Lever Chair, Maroon Plush, old style back, fair order	110.00
1	S. S. White Pedal-Lever Chair, Maroon Plush, latest style back, good order	125.00
1	Archer Oiled Walnut Chair No. 2, Maroon Plush, with Footstool, good order	45.00
1	Snowden & Cowman Chair, Green Plush, attached Footstool. Very good order	45.00

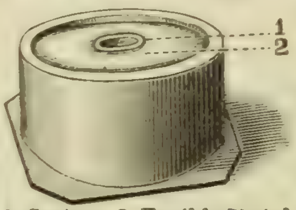
AT THE BOSTON DEPOT.

1	P. L. Chair with Wilkerson Head-rest, latest style back, Maroon Plush	$125.00
1	Harris Chair, Medium Base, Garnet Plush. New	100.00
1	Harris Chair, High Base, in Green Plush, fair condition, for only	70.00
1	Cycloid Chair, Corded, with Spittoon	60.00
1	Archer No. 2 Chair, Open Arms, Maroon Plush, with Footstool and Spittoon, in good order	40.00
1	Cycloid Chair, Maroon Plush, with Spittoon	70.00
1	Archer Chair, No. 2, Open Arm, Green Plush, No. 2 Footstool, and Spittoon	45.00
1	Archer No. 2 Closed Arm Chair, Green Plush, with Footstool and Instrument Stand	28.00
1	Archer No. 1 Cabinet, used but little	25.00
1	S. S. W. Dental Engine, new style, with drop arm, No. 6 Hand-piece, in nice order	30.00
1	Bonwill Engine	20 00
1	No. 2 Office Lathe, good order	14.00
1	Welch Lathe, Head and Chucks, with Diamond Wheel, but little used	12.00
1	U. S. Lathe, Short Spindle, good order	10.00
1	Seabury Vulcanizer, with Globe Valve, cost $35.00 new (not ours), will sell for	15 00
1	Morrison Dental Engine, No. 4 Hand-piece, in good order, only	10.00
1	S. S. W. Engine, Old Style, No. 6 Hand-piece	20.00

The prices named do NOT include charges for Boxing, when necessary.

Fusible Metal Dies for Holding Bands.

DEVISED BY DR. E. L. TOWNSEND.



1, Socket. 2, Fusible Metal.

Dr. Townsend's device is primarily intended to supply an easy means of banding the Logan crown, thus increasing the strength of this admittedly strongest crown made. In using this device it is not necessary to leave the operating room, and a half-hour is ample time to fit the band and adjust the porcelain to it. The inventor claims that it will save in gold the cost of the appliance on the first tooth set, and the trouble and dirt incident to investing and soldering; and that it will make the crown so strong that there is almost no risk of breakage.

Full directions sent with each Die.

Price . . . . each $1.00

DIE AND COUNTER-DIE METALS.

We ask special attention to the "new departure" we have inaugurated in putting up base metals. We now sell them in half-pound ingots, each ingot stamped with the name of the metal, whether zinc, tin, lead, crown-hub, or Babbitt-metal, and as a guarantee of quality, with the initials of the company.

Our Babbitt-metal for dies and Counter-Die metal are made from Dr. Haskell's formulas.

Prices given below are present rates. They are liable to change at any time.

PRICES.

Babbitt-metal (Haskell's formula)	per lb.	50	cents.
Counter-Die Metal	"	25	"
Crown-Hub Metal	"	35	"
Zinc	"	14	"
Tin	"	45	"
Lead	"	12	"

BRITANNIA IMPRESSION TRAYS.

Several new forms and sizes of Impression Trays having been added to our stock since the publication of our last Impression Tray pamphlet, the following list with prices attached will be found useful in making up orders:

Uppers No. 1 to 8	30	cents	each.
" " 12 to 16	30	"	"
" " 17 to 19 adjustable	40	"	"
" " 2½, 3½, and 4½, especially adapted for plaster	30	"	"
Lowers No. 1 to 16	30	"	"
" " 17 adjustable	40	"	"
" " 18 and 19, Dr. Dorr's pattern	40	"	"
" " 21 and 22, Dr. Struppler	40	"	"
Partial Upper No. 9	25	"	"
" " " 10, Dr. Mathews	30	"	"
" for Crowns, No. 20, Dr. Melotte	30	"	"
Franklin's Nos. 2 and 3	50	"	"
Wardle's Movable Palate Tray, 1 Tray and 2 Palate Plates	$1.00		

Revised edition of our Impression Tray pamphlet sent on application.

A PRACTICAL TREATISE

ON

ARTIFICIAL CROWN- AND BRIDGE-WORK.

By GEORGE EVANS.

WITH 500 ILLUSTRATIONS.

Octavo. Cloth. 258 pp. Price, $3.00.

The author is well known as an ingenious expert in the field of which his volume treats, and as might be expected the work is eminently practical. But little space is given to theorizing upon disputed points, the main object of the writer being to tell, in as few words as will make his meaning clear, the best methods of procedure in Crown- and Bridge-work. To this end he has enlisted the engraver's art wherever a picture would tell the story graphically. The book is almost profusely illustrated, more than half the figures having been drawn by the author.

Much that is new in practical devices is here presented, together with what has been found valuable in the methods published by others in the dental journals.

To those interested in Crown- and Bridge-work (and who among dentists is not?) this volume will be indispensable, as within its covers are to be found plain, practical directions by which, with the exercise of a little ingenuity in adaptation, any suitable case can be treated.

Sent by mail on receipt of the price, or can be ordered through dealers in dental supplies or book-sellers.

THE S. S. WHITE DENTAL MFG. CO.,
Publisher.

OUR SUBSCRIPTION BUREAU.

About a year ago we offered our services to such of our patrons in foreign lands as desired to subscribe to American periodicals. A large number availed themselves of the opportunity, and so far we have not had a single complaint. We now beg to renew and extend our offer of last year. We will supply to any of our patrons any periodical—dental, medical, scientific, literary, special, or general—they may desire to receive, at the usual publisher's prices. When postage is charged, this must be added to the usual price in the country in which the paper or journal is published.

THE S. S. WHITE DENTAL MFG. CO.

PHILADELPHIA DENTAL COLLEGE

AND

HOSPITAL OF ORAL SURGERY.

18TH AND CHERRY STREETS.

ANNOUNCEMENT, SESSION 1888-89.

During the last year the college has been removed to Cherry above 17th St., with a view to enlarged accommodations made necessary by a constantly increasing class. In addition to conveniences already possessed, which are certainly not surpassed, if equaled by any dental college, new lecture hall, general laboratories, dissecting rooms, etc., are now in process of erection, the cost of which is to be over seventy-five thousand dollars.

The Regular Winter Course commences October 1, and closes on the last day of February ensuing. A preliminary Fall course, free to students of Winter term, begins September 15.

The Dispensary and Laboratory are open all the year, except during the summer vacation. Instruction in *Practical Dentistry* has ever been a prominent feature of the institution, under the supervision of the Professor of Clinical Dentistry, who, aided by competent Demonstrators, will give special attention to the interests of students. The Dispensary consists of large, well-lighted rooms, furnished with comfortable operating-chairs, tables, and all conveniences. As an excess of patients is in attendance at the clinics, the opportunities here presented for acquiring a practical knowledge of dentistry are ample and complete. The new laboratory is the largest of its kind in the country.

A clinic in *Oral Surgery* is held every Saturday at 12 M.

Graduation.—Two years' study, including attendance upon two regular winter courses of Lectures and satisfactory examinations in theory and practice, are required for graduation. Attendance on one regular winter course in any recognized Dental College will be accepted as an equivalent for one course. Graduates in medicine are eligible for graduation in dentistry after one year's attendance on lectures and clinical service.

Fees.—Tickets, including the Demonstrators', $100; Matriculation, inclusive of Syllabi for home study (paid but once), $5; Diploma, $30. Board, $4 to $6 per week.

Special Notice.—Commencing with the present session, 1888-89, the usual preliminaries for the degree of the College will be so divided as to enable the student to take his examinations on Applied Anatomy, Chemistry, and Mechanical Dentistry at the end of the first year, and to complete them at the end of the second on the branches of Physiology, Dental Pathology and Therapeutics, and Operative Dentistry.

ROSTER OF LECTURES.

PRACTICAL DENTAL CLASSES DAILY FROM 9 A.M. TO 3 P.M.

MONDAY,	3 P.M.—FLAGG,	4 P.M.—STELLWAGEN,	5 P.M.—HOWELL.
TUESDAY,	3 " FLAGG,	4 " STELLWAGEN,	5 " GUILFORD.
WEDNESDAY,	3 " CLINIC,	4 " HOWELL,	5 " GARRETSON.
THURSDAY,	3 " FLAGG,	4 " STELLWAGEN,	5 " GUILFORD.
FRIDAY,	3 " DORR,	4 " HOWELL,	5 " GARRETSON.

SATURDAY, 8 A.M.—GUILFORD; 12 M.—GARRETSON, SURGICAL CLINIC.
SATURDAY, 3 P.M.—OPERATIVE AND MECHANICAL CLINICS BY CLINICAL INSTRUCTORS.

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JAMES E. GARRETSON, M.D., D.D.S., Professor of Anatomy and Surgery. Surgeon to the Oral Clinic.

M. H. CRYER, M.D., D.D.S., Chief Assistant of Oral Surgical Clinic.
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For announcements containing particulars address

Dr. JAMES E. GARRETSON, Dean of the Faculty,
1537 Chestnut Street, Phila., Pa.

CHICAGO COLLEGE OF DENTAL SURGERY

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*Prof. Cushing will be in attendance in the Infirmary and demonstrate Operative Dentistry from 1 to 4 P.M., Mondays and Wednesdays during the entire sessions.
†Prof. Ames will demonstrate continuous-gum work.
‡Prof. Black will be in constant attendance supervising the instruction in all of the Clinical Departments.

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D. M. CATTELL, D.D.S., Instructor in Operative Technics.

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——— ——— Demonstrator of Prothetic Dentistry.

FEES FOR THE REGULAR WINTER COURSE.

The Fees are payable in advance.

Matriculation Fee	$5.00
Tickets for the Course	75.00
Demonstration of Anatomy, including material	10.00
Chemical Laboratory	5.00
Histological Laboratory	5.00
Final Examination Fee—not returnable	25.00

FEES FOR THE ANNUAL SPRING COURSE.

Matriculation Fee (good till the following April)	$5.00
Lecture Tickets	20.00

(This amount will be deducted from the fees of the next following winter session.)

Fee for Practical Chemistry	$5.00

Instruments and appliances for clinical departments will cost from $25 to $40.

Graduates of the College are admitted on payment of the matriculation fee only; graduates of other regular dental colleges on payment of matriculation fee and ten dollars.

Board, including light and fuel, can be obtained at a convenient distance from the College, at from four to six dollars a week.

The Annual Course of lectures will begin Wednesday, September 26, 1888, and continue until March 31, 1889.

The Spring Course will begin Tuesday, April 3, 1888,—the week following Commencement Day,—and terminate on the 20th of the following June.

Letters of inquiry should be addressed to

Dr. TRUMAN W. BROPHY, Dean,
96 State St., Chicago, Ill.

BOSTON DENTAL COLLEGE.

BOSTON, MASS.

1888-89.

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The year begins on the Thursday following the first Wednesday in October, and ends on the fourth Wednesday in June.

It is the object of the Faculty to present a complete course of instruction in the theory and practice of Dentistry, and for this purpose a well-appointed laboratory and infirmary are provided, at which there is an ample number of patients, insuring to all students abundant opportunities for operating at the chair and becoming by actual practice familiar with all the operations demanded of the Dentist.

The Laboratory and Operating Room will be open at 9 o'clock A.M. Demonstrators will be present daily during working hours.

Students who began their professional studies elsewhere may be admitted to advanced standing. No student may advance with his class or be admitted to advanced standing until he has passed the required examinations on the studies of the previous year.

Every candidate for the degree must have passed a satisfactory examination in every one of the departments of dental instruction at regular periods of the College course.

The annual examinations will be conducted by a Board of Examiners. All candidates for admission are required before examination to produce certificates of good moral character, and students from other colleges are required to bring certificates from those colleges of honorable dismission. For admission they must present a degree in letters, science, or medicine from a recognized college or scientific school, or pass an examination in the following subjects:

1.—ENGLISH. Every candidate will be required to write legibly and correctly an English composition, and also to write English prose from dictation.

2.—PHYSICS. A competent knowledge of physics. (See Balfour Stewart's "Elements of Physics.")

Candidates from foreign countries must be able to speak the English language, and must present certificates of pupilage or length of practice, duly legalized by the authorities.

FEES AND EXPENSES.

For Matriculation	$5.00
For a year	100.00
For Demonstrator's Ticket (Anatomy)	5.00

There is no Diploma Fee, and no Fee for Graduation.

For further information, address

J. A. FOLLETT, M.D., Dean,

219 Shawmut Avenue, Boston, Mass.

UNIVERSITY OF MARYLAND.

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Dr. GEO. H. WINKLER	Ga.	Dr. L. G. NOEL	Tenn.
Dr. B. M. WILKERSON	Md.	Dr. V. E. TURNER	N. C.
Dr. T. T. MOORE	S. C.	Dr. GEO. W. FIELD	Eng.
Dr. JOHN MURRAY	Penna.	Dr. W. C. WARDLAW	Ga.
Dr. W. S. McDOWELL	Md.	Dr. A. F. CLAYWELL	Tenn.
Dr. WILLIAM FARMER	Va.	Dr. GEO. B. STEEL	Va.
Dr. JUDSON B. WOOD	Va.	Dr. HENRY C. JONES	Va.
Dr. GEORGE H. CHEWNING	Va.	Dr. W. S. CARRUTHERS	Texas.
Dr. G. F. S. WRIGHT	S. C.	Dr. DAN'L McFARLAN	D. C.
Dr. WALTER S. HARBAN	D. C.	Dr. A. G. BOUTON	Ga.
Dr. ROBT. Y. HENLEY	Va.	Dr. THOS. H. DAVY	Md.
Dr. ELLIS B. BLISS	D. C.	Dr. B. H. TEAGUE	S. C.
Dr. ARTHUR M. RICE	Conn.	Dr. WM. B. WISE	Va.

At stated times during the Annual Sessions a number of the Corps of Clinical Instructors will hold Clinics and deliver Clinical Lectures.

Each year since its organization has added to the reputation and prosperity of this University Dental School, until now its graduates, in almost every part of the civilized world, are meeting with the success that ability will ever command. The past session was the most successful one in number of matriculates ever held; and visiting dentists from all parts of this country have expressed themselves as being astonished and gratified at the ability shown by the students when operating upon patients in the Infirmary. Forming one of the departments of *one of the oldest Universities* in this country, its diploma is everywhere recognized and honored.

The instruction in both operative and mechanical dentistry is as thorough as it is possible to make it, and embraces everything pertaining to dental art. The advantages which the general and oral surgical clinics, to which the dental students are admitted, as indeed to all the lectures of the University, afford, cannot be overestimated. The many thousands of patients annually treated in the University Hospital, which is well known to be the largest Hospital in Baltimore, afford an abundance of material for the dental infirmary and laboratory practice, and the oral surgery clinics.

The Dental Infirmary and Laboratory Building is one of the largest and most complete structures of the kind in the world. The Infirmary is lighted by forty-seven large windows, and is furnished with the most improved operating chairs.

The Dental Infirmary and Laboratory are open daily (except Sundays) during the entire year for the reception of patients; and *the practice for dental students* has increased to such an extent that all the students during the past session have had an abundance of practical work in both operative and prosthetic dentistry—the Record Books showing to the credit of many of them *hundreds* of gold fillings inserted for Infirmary patients, besides other operations. This means for practical instruction has already assumed such large proportions that the supply has been beyond the needs of the large classes in attendance during the past sessions.

The exceedingly large number of patients for the extraction of teeth affords ample facilities for practical experience to every student.

In addition to the facilities afforded by this institution for a thorough course of instruction in the theory and practice of dentistry, the clinics in the University Hospital enable the Dental equally with the Medical Students to become familiar with the diseases and operations of Practical Surgery; excisions of jaw, partial or entire; tumors, cancerous or benign, of various parts of the buccal cavity;

UNIVERSITY OF PENNSYLVANIA.

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EDWIN T. DARBY, M.D., D.D.S., Professor of Operative Dentistry and Dental Histology.

JAMES TRUMAN, D.D.S., Professor of Dental Pathology, Therapeutics, and Materia Medica.

JOSEPH LEIDY, M.D., LL.D., Professor of Anatomy.

THEODORE G. WORMLEY, M.D., LL.D., Professor of Chemistry.

EDWARD T. REICHERT, M.D., Professor of Physiology.

ROBERT HUEY, D.D.S., Lecturer on Operative Dentistry.

Students of the Dental Department have access without additional charge to all the other lectures and clinics in the Medical Department.

Surgical Clinics at University Hospital twice a week; at Philadelphia Hospital, contiguous to the grounds of University, Wednesday and Saturday.

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JAMES E. LODER, D.D.S., 2d Assistant Demonstrator of Operative Dentistry.
JOSEPH W. WHITE, D.D.S., 3d Assistant Demonstrator of Operative Dentistry.
MILTON POWEL, D.D.S., 4th Assistant Demonstrator of Operative Dentistry.
J. JUDSON EDWARDS, D.D.S., Demonstrator of Mechanical Dentistry.
H. B. McFADDEN, D.D.S., 1st Assistant Demonstrator of Mechanical Dentistry.
AMBLER TEES, JR., D.D.S., 2d Assistant Demonstrator of Mechanical Dentistry.
R. H. D. SWING, D.D.S., 3d Assistant Demonstrator Mechanical Dentistry.
FRED. W. AMEND, JR., D.D.S., 4th Assistant " " "
JOHN B. DEAVER, M.D., Demonstrator of Anatomy.
JOHN MARSHALL, M.D., Demonstrator of Practical Chemistry.

CLINICAL INSTRUCTORS.

DR. C. S. BECK.	DR. E. H. NEALL.	DR. R. R. UNDERWOOD.
DR. H. C. LONGNECKER.	DR. H. C. REGISTER.	DR. I. F. WARDWELL.
DR. W. G. A. BONWILL.	DR. GEO. W. KLUMP.	DR. J. A. WOODWARD.
DR. W. R. MILLARD.		

The appointments of the Lecture-Rooms, Operating-Room, and Laboratories are the most complete in America.

The belief entertained when the Dental Department was started that the facilities for obtaining a supply of clinical patients were ample, has been fully realized, and owing to the unequaled accommodations and appointments of the new operating-room, the daily applications are now largely in excess.

Laboratory instruction of each student, not only in Practical Dentistry but also in Practical Chemistry, forms a prominent feature in the Department of Dentistry.

FEES.

Matriculation Fee . . .	$5.00	Dissecting Fee	$10.00
Fee for One Course of Lectures	100.00	Graduation Fee	30.00

Board can be obtained at from five to eight dollars per week, according to location and accommodations. In locations near the college, students generally pay about five dollars per week.

University of Pennsylvania.—Dental Department.

The dental department possesses the means for thorough training, both theoretical and practical, not surpassed, it is believed, by any other institution. The operating-room is 151 feet in length by 46 feet in width, and lighted by windows on all sides. In front of each window is placed a Morrison Chair, a handsome nickel-plated movable bracket, and a neat walnut table. Battery-wires are arranged to a number of the chairs for the use of electric pluggers.

The Mechanical Laboratory is supplied with all the modern appliances, and is under the care of an able and experienced mechanician. Special clinics will be given in continuous-gum work by the professor of mechanical dentistry and metallurgy.

The extensive Chemical Laboratories are under the charge of a demonstrator well qualified to meet all the requirements of his position.

The Dissecting-Room is large, well lighted, thoroughly ventilated, and is furnished with ample material for the successful prosecution of anatomical studies.

THE REGULAR OR WINTER SESSION.

The session will commence on Monday, October 1, and continue until the last of April. The number of lectures per week, with a synopsis of the various branches taught, will be found in the General Catalogue.

In order to facilitate work in the practical departments, and to fully employ the student's time, the regular winter sessions are so arranged that the first-course student is required to devote the morning hours equally between *dental and chemical laboratory work.*

The second-year student, having passed in chemistry and materia medica, is not required during his second course to attend the lectures upon them; thus he has the entire forenoon of each day for practical dental work.

It is the desire of the Faculty to offer every opportunity for the acquirement of practice in operative and mechanical dentistry, and as many large operations in the mouth require the morning light, and more time in their performance than an afternoon affords, permission will be given to the second-course student to devote the morning hours to this object when required.

It is believed that this plan of *grading the course*, and of affording the first-year student an opportunity of coming forward for examination in the branches of chemistry and materia medica, will not only prove an economical arrangement of his time, but will really facilitate his labors in the acquirement of knowledge in the remaining branches.

PLAN OF EXAMINATIONS.

Attendance upon two regular winter courses of lectures will be required before the final examination for the degree of Doctor of Dental Surgery.

At the close of the first year, examinations are held in *chemistry and materia medica.* If the student is not qualified, a second examination is afforded him at the beginning of the next winter session.

The final examination is in *anatomy*, *physiology*, *operative dentistry*, *mechanical dentistry*, *metallurgy*, and *dental pathology and therapeutics.*

Students who have attended one full term in another dental school recognized by the Faculty will be admitted to the graduating class upon presentation of the required certificate.

Students holding a medical diploma will be admitted to the Senior Class, but will be required to spend a year in the study of practical Dentistry in the Operative and Mechanical Departments, the year to include the regular winter's course of lectures.

Students who have attended but one course in a medical college will be required to take two winter courses in this Department.

A preliminary examination will be required for entrance to the first or Junior year. The requirements will be a good English education.

Students who have certificates properly attested from colleges or other schools of reputable character will be accepted without examination.

JAMES TRUMAN, D.D.S.,
Secretary of the Dental Faculty, 3249 *Chestnut Street*,
PHILADELPHIA.

In directing letters addressed to this department, for catalogues or other information, correspondents are requested to write the word Secretary (not Dean) under the name.

ESTABLISHED 1845.

Ohio College of Dental Surgery.

DEPARTMENT OF DENTISTRY—UNIVERSITY OF CINCINNATI.

SESSIONS 1888-89.

FACULTY.

J. S. CASSIDY, M.D., D.D.S., Professor of Chemistry and Materia Medica.

H. A. SMITH, D.D.S., DEAN OF THE FACULTY, Professor of Operative Dentistry and Dental Pathology.

C. M. WRIGHT, D.D.S., Professor of Physiology and General Pathology.

WM. KNIGHT, M.D., D.D.S., Professor of Anatomy and Oral Surgery.

GRANT MOLLYNEAUX, D.D.S., Professor of Mechanical Dentistry and Metallurgy.

GEO. W. KEELY, D.D.S., *Lecturer on Irregularities of the Teeth.*

DEMONSTRATORS.

B. C. HINKLEY, D.D.S., Demonstrator of Operative Dentistry.

G. S. JUNKERMAN, M.D., D.D.S., Demonstrator of Analytical Chemistry.

H. C. MATLACK, D.D.S., Demonstrator of Anatomy.

C. NEIDHAMER, Demonstrator of Mechanical Dentistry.

The Forty-third Annual Winter Session begins Tuesday, October 2, 1888, and closes March 1, 1889.

The Annual Spring Session begins about April 1, 1889, and continues eight weeks.

The requirements for admission and graduation are those adopted by the National Association of Dental Faculties.

FEES.

Matriculation Fee (but once)	$5.00
Professors' Tickets	75.00
Dissecting Ticket, including Material	10.00
Analytical Chemistry	10.00
Diploma Fee	25.00
Spring Course Tickets	20.00

For further information and Announcements, address

H. A. SMITH, Dean,

128 Garfield Place, Cincinnati, O.

NEW YORK COLLEGE OF DENTISTRY

1888-89.

GOVERNING FACULTY.

FANEUIL DUNKIN WEISSE, M.D., Professor of Regional Anatomy and Oral Surgery.
FRANK ABBOTT, M.D., Dean of the Faculty, Professor of Operative Dentistry and Dental Therapeutics.
ALEXANDER WILLIAM STEIN, M.D., Professor of Visceral Anatomy, Physiology, and Histology.
FRANK LeROY SATTERLEE, M.D., Ph.D., Professor of Chemistry and Metallurgy.
JAMES BOND LITTIG, D.D.S., Professor of Mechanical Dentistry.

REGULAR SESSION LECTURERS.

FRANK W. JACKSON, M.D., Lecturer upon Anesthetics.
CARL HEITZMANN, M.D., Lecturer upon Dental Histology.
F. HASBROUCK, D.D.S., Lecturer upon Nitrous Oxide.

ASSISTANTS.

SILAS C. BLAISDELL, M.D., DOMINGO M. SABATER, A.B., D.D.S., M.D., Assistants to the Chair of Regional Anatomy and Oral Surgery.
ALFRED R. STARR, M.D., D.D.S., Assistant to the Chair of Operative Dentistry and Dental Therapeutics.
———————— Assistant to the Chair of Visceral Anatomy, Physiology, and Histology.
CHARLES E. H. PHILLIPS, D.D.S., Assistant to the Chair of Mechanical Dentistry.
W. TERRELL DAWSON, A.B., M.D., Assistant to the Chair of Chemistry and Metallurgy.

CLINICAL STAFF OF REGULAR SESSION.

J. F. P. HODSON, D.D.S., Director.

WILLIAM CARR, D.D.S.	HENRY J. HULL, D.D.S.	F. H. LEE, D.D.S.
WILLIAM C. DEANE, D.D.S.	F. A. ROY, D.D.S.	F. H. WHITE, D.D.S.
T. A. FLETCHER, D.D.S.	J. F. P. HODSON, D.D.S.	R. M. SANGER, D.D.S.
S. H. McNAUGHTON, D.D.S.	WM. T. LaROCHE, D.D.S.	CHARLES A. DUBOIS, D.D.S.
ROBERT A. FONES, D.D.S.	ALFRED R. STARR, D.D.S.	BENJ. C. NASH, D.D.S.
M. C. GOTTSCHALDT, D.D.S.	SHERMAN B. PRICE, D.D.S.	C. L. DUBAR, D.D.S.

SPRING COURSE LECTURERS.

———————— Lecturer upon Anatomy.
ALFRED R. STARR, M.D., D.D.S., Lecturer upon Operative Dentistry.
FRANK A. ROY, M.D., D.D.S., Lecturer upon Physiology.
MARTIN C. GOTTSCHALDT, D.D.S., Lecturer upon Chemistry.
R. McLEAN SANGER, D.D.S., Lecturer upon Mechanical Dentistry.

SUPERINTENDENTS OF THE INFIRMARY.

DOMINGO M. SABATER, A.B., D.D.S., M.D., Operative Dentistry.
CHAS. L. BERGER, D.D.S., Mechanical Dentistry.
J. A. BRADSHAW, A.M., Secretary.

DEMONSTRATORS.

LOUIS E. STUART, D.D.S.	CORTEZ J. MAPP, D.D.S.
FERDINAND HEINDSMANN, Jr., D.D.S.	SIMON T. A. MÜLLER, D.D.S.
THOMAS H. STEVENS, D.D.S.	FRANCIS A. CHICHEBIO, D.D.S.

Students may matriculate at any time, as the Infirmary is open for regular students of the College to practice in the entire year.

The Regular Course of Lectures will commence on Monday, October 1, and continue until the first of March. The Spring Course will commence about the 15th of March, and continue until about the 1st of May. Three hours of each day of the week (except Saturday) will be devoted to Lectures, and four hours to *Clinics* and practice at the Chair and in the Laboratory under the direction of the Demonstrators.

With increased and greatly-improved accommodations in the Infirmary and Laboratory, we now offer to students most extensive and perfect practical facilities for acquiring an education.

FEES.

Matriculation	$5.00
Course of Lectures—Winter	100.00
Practical Course—Spring and Summer (Optional)	45.00
Final Examination	30.00

Board may be obtained for from $5 to $8 per week.

For further information, address

FRANK ABBOTT, M.D., Dean,

22 West Fortieth Street, New York.

The Baltimore College of Dental Surgery.

Chartered by the Legislature of Maryland in 1839.

THE OLDEST DENTAL COLLEGE IN THE WORLD.

FACULTY.

RICHARD B. WINDER, M.D., D.D.S., Professor of Dental Surgery and Operative Dentistry.
M. WHILLDIN FOSTER, M.D., D.D.S., Professor of Therapeutics and Pathology.
WM. B. FINNEY, D.D.S., Lecturer on Dental Mechanism and Metallurgy.
B. HOLLY SMITH, M.D., D.D S., Lecturer on Special Anatomy and Dental Materia Medica.
THOMAS S. LATIMER, M.D., Professor of Physiology.
JAMES E. LINDSAY, M.D., Professor of Chemistry.
CHARLES F. BEVAN, M.D., Professor of Anatomy.
OSCAR J. COSKERY, M.D., Clinical Professor of Oral Surgery.
RICHARD GUNDRY, M.D., Professor of Materia Medica.

CLINICAL INSTRUCTORS.

CORYDON PALMER, D.D.S., *Ohio.*
E. PARMLY BROWN, D.D.S., *N. Y.*
A. L. NORTHROP, D.D.S., *N. Y.*
CHAS. R. BUTLER, D.D.S., *Ohio.*
E. L. HUNTER, D.D.S., *N. C.*
W. W. WALKER, D.D.S., *N. Y.*
T. S. WATERS, D.D.S., *Md.*
DAVID GENESE, D.D.S., *Md.*
J. HALL MOORE, M.D., *Va.*
JOHN ALLEN, D.D.S., *N. Y.*
R. B. DONALDSON, D.D.S., *D. C.*
JOHN MEYER, D.D.S., *N. Y.*
H. A. PARR, D.D.S., *N. Y.*
J. EMORY SCOTT, D.D S., *Md.*
E. R. RUST, D.D.S., *D. C.*
C L. ALEXANDER, D.D S., *N. C.*

DEMONSTRATORS.

R. B. WINDER, Jr., Phar. G., D.D.S., Demonstrator of Operative Dentistry.
W. G. FOSTER, D.D.S., Demonstrator of Mechanical Dentistry.

ASSISTANT DEMONSTRATORS.

GEORGE G. HARDY, D.D.S.
W. W. DUNBRACCO, D.D.S.
J. W. SMITH, D.D.S.
G. MARSHALL SMITH, D.D.S.
J. E. ORRISON, D.D.S.
C. S. SEIBOLD, D.D.S.

J. W. CHAMBERS, M.D., Demonstrator of Anatomy.
J. H. BRANHAM, M.D., Assistant Demonstrator of Anatomy.

The Baltimore College of Dental Surgery, the first and for many years the only Dental School, offers facilities for the study of Dentistry proper, such as age and experience only can give. Its immense *museum*, complete apparatus, large and well-arranged building, and carefully-studied *curriculum* give to its students great advantages and opportunities, both theoretical and practical, while its age gives its Dip'oma a dignity far out-ranking all other Colleges—a diploma honorably represented in all civilized countries, and held by the most distinguished members of the Dental Profession.

The fact that Dentistry must be *practically taught* is fully recognized, *the College Infirmary*, a most complete, large, and handsome *Hall*, being daily filled with clean and respectable patients, of a class nearly equal to those of the average dentist. *This Infirmary is open all the year*, students paying an entrance fee which is deducted from those of the regular succeeding course.

The session begins Oct. 1, closing in March. A large corps of Demonstrators, always present, put in actual practice the teachings of all lecturers on Dentistry—leaving nothing undemonstrated. *All methods are fully taught*, all appliances and apparatus used; the making of instruments and the most elaborate gold and continuous-gum work, and all the cases arising in ordinary practice, with many which are rarely seen, carefully demonstrated.

The College has formed an alliance with the College of Physicians and Surgeons by which its students are privileged to attend all lectures and clinics. The patients of this medical school numbered last year over 40,000.

Graduates of the Baltimore College of Dental Surgery are required to attend but *one session* at the College of Physicians and Surgeons prior to presenting themselves as candidates for the degree of M.D. (See Catalogue.) In accordance with the requirements of the National Association of Dental Faculties, the qualifications for entering the Junior Class are a preliminary examination in the ordinary English branches.

TERMS OF GRADUATION.—Attendance on two Winter courses of lectures in this College; as equivalent to one of these we accept *one course* in any reputable Dental College. *Graduates in Medicine* who have attended one Winter Course in this College and have passed one year, inclusive of the Winter Course, in the practical work of the Infirmary and Laboratory, will be permitted to present themselves for graduation.

BENEFICIARY STUDENTS.—Each State Dental Society is privileged to send one Beneficiary Student to this College at one-half the regular tuition fees. This has been for some years an established feature of this College.

FEES.—Matriculation (paid once only), $5.00. Tuition fees, $100.00. Diploma fee, $30.00. Dissecting fee, $10.00.

Students corresponding with the Dean will please be careful to give full address, and direct their letters to

Prof. R. B. WINDER, Dean,

No. 140 Park Avenue, Baltimore, Md.

UNIVERSITY OF CALIFORNIA, DENTAL DEPARTMENT.

Toland Hall, Stockton Street, between Chestnut and Francisco Streets,

SAN FRANCISCO, CAL.

FACULTY.

HORACE DAVIS, A.M., President of the University and ex-officio President of the Faculty.
JOSEPH LE CONTE, M.D., LL.D., Honorary Professor of Biology.
C. L. GODDARD, A.M., D.D.S., Professor of Mechanical Dentistry.
W. E. TAYLOR, M.D., Professor of Principles and Practice of Surgery.
A. L. LENGFELD, M.D., Professor of Chemistry and Materia Medica.
WILLIAM B. LEWITT, M.D., Professor of Anatomy.
MAURICE J. SULLIVAN, D.D.S., Professor of Dental Pathology and Therapeutics.
L. L. DUNBAR, D.D.S., Professor of Operative Dentistry and Dental Histology.
A. A. DANCONA, A.B., M.D., Professor of Physiology.

DEMONSTRATORS.

F. J. SAXE, A.M., D.D.S., } Demonstrators of Operative Dentistry.
M. F. GABBS, D.D.S., }
CHARLES BOXTON, D.D.S., Demonstrator of Mechanical Dentistry.
R. E. PAYNE, D.D.S., Assistant Demonstrator of Mechanical Dentistry.
JOHN M. WILLIAMSON, M.D., Demonstrator of Anatomy.
HENRY L. TEVIS, M.D., Assistant Demonstrator of Anatomy.
WINSLOW ANDERSON, M.D., Assistant to the Chair of Materia Medica.

CLINICAL INSTRUCTORS.

H. C. DAVIS, L.D.S.	W. E. PRICE, D.D.S.	A. F. McLAIN, M.D., D.D.S.
H. E. KNOX, D.D.S.	MAX SICHEL.	THOMAS MORFFEW, D.D.S.
B. W. HAINES, M.D., D.D.S.	W. B. KINGSBURY.	L. VAN ORDEN, M.D.
		W. WOOD.

N.B.—Demonstrators and Clinical Instructors appointed annually.

March 5, 1888, the Dental Department of the University of California commences its seventh annual session. From the very beginning it has succeeded far beyond the fondest hopes of its founders and the sanguine expectations of its friends. The number and character of its students have exceeded the anticipations of *both* founders and friends. While we feel fully justified in saying that from the organization of the Dental Department of the University of California the facilities and opportunities for securing a dental education in it have been equal to any other similar institution of learning in the country, we are equally aware that the profession and the people would justly have more confidence in the scholarship and capabilities of graduates of a dental college that requires three years' study, including two terms of nine months each, than they would have in those of graduates from a college that requires two terms of but four or five months' attendance at most, with a preliminary term of a month or two, the attendance upon which is optional with the student. This plan of a nine months' term gives longer time for study and more for practical instructions and less *crowding* of both. We are glad to be able to say that the more intelligent students and those who are actuated by the best motives favor the step in advance. For the course of study, we refer to our Annual Announcement, which will be furnished anyone upon application.

Surgical and medical clinics are held at the hospital three times a week, to which the dental students are admitted with all the privileges accorded to medical students. The Lecture Rooms, Operating-Rooms, and Laboratories are commodious, and their appointments complete,—not excelled by any college of the kind in the country.

REQUIREMENTS FOR ADMISSION.—Every candidate for admission must be eighteen years of age, and must present to the Faculty satisfactory evidence of a good moral character. Unless already a matriculate of the University of California, or of some other recognized college or university, or a graduate of some recognized academy or high school, or holding a teacher's certificate, he must pass an examination in Arithmetic, Geography, English Grammar and Composition, U. S. History, Natural Philosophy, and Chemistry. The preliminary examination for the session of 1888 will be held March 2d. He shall subscribe to Article II., Section 3, of the Code of Ethics of the American Dental Association.*

JUNIOR EXAMINATION.—At the end of the Junior year students will be examined in Anatomy, Physiology, Chemistry (or Materia Medica), Histology, and Mechanical Dentistry, and those who are qualified will receive certificates of admission to the Senior Class.

REQUIREMENTS FOR GRADUATION.—The candidate for the degree of Doctor of Dental Surgery must have attained the age of twenty-one years. He shall have passed a satisfactory examination, both oral and written,—a written examination being substituted in this college for a thesis. He shall have studied dentistry *three* years, including two courses of lectures, one of which shall be at this institution. Graduates in medicine may apply for the degree of D.D.S., after having had two full years of practical instruction or experience in dentistry, one year of which, including one course of lectures, must be spent in the Dental Department of the University of California. After these requirements have been complied with, upon recommendation of the Faculty and approval by the Board of Regents, the candidate shall receive the degree of Doctor of Dental Surgery.

FEES.

Matriculation (paid but once)	$5.00	Tuition, third year	Free
Tuition, first year	120.00	Demonstrator of Anatomy's Fees, each year	$10.00
" second year	120.00	Diploma	30.00

C. L. GODDARD, Dean,

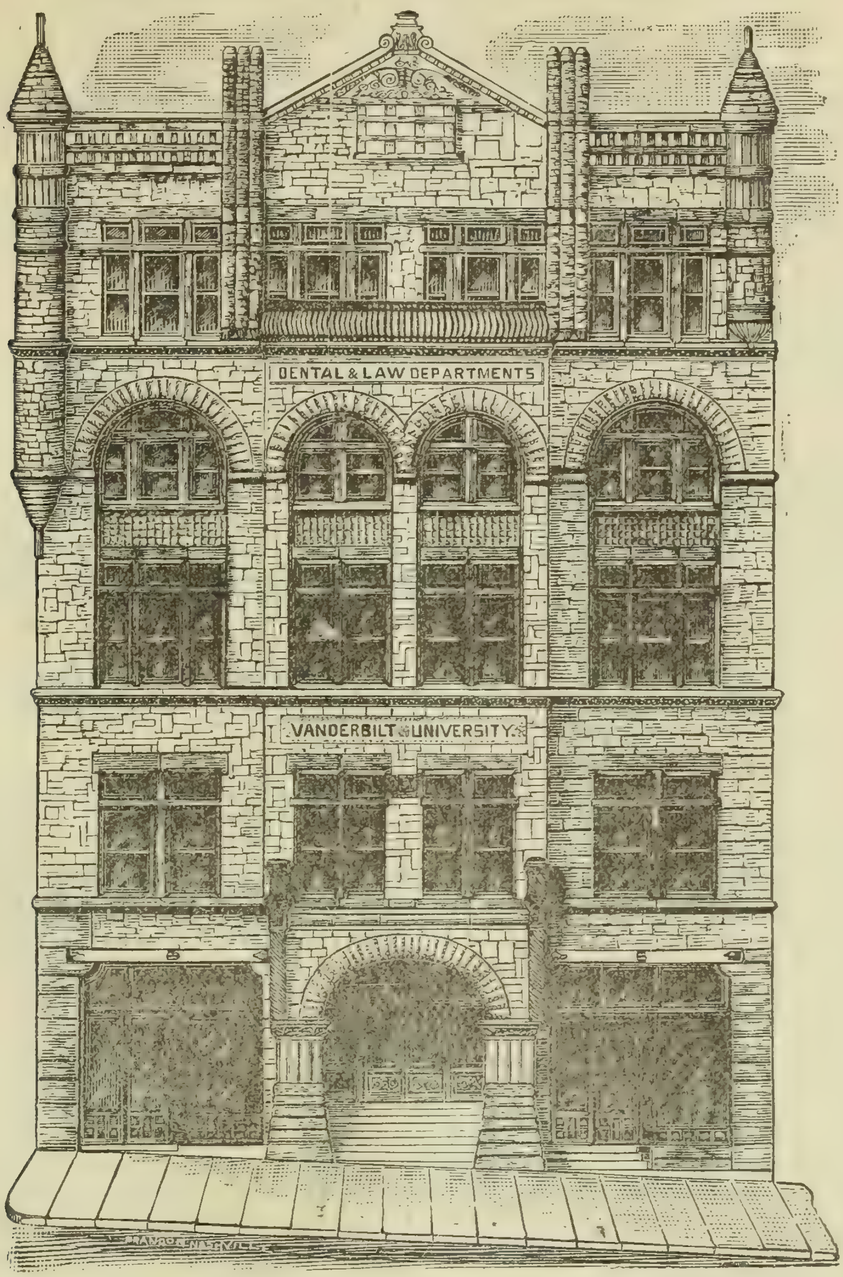
131 Post St., San Francisco, Cal.

N.B.—The Medical and Dental Colleges of the University of California, as well as other medical colleges, unlike similar institutions in the Eastern States, hold their sessions during the Spring, Summer, and Fall months.

* The object of this requirement is to prevent students committing unprofessional acts during their college course.

VANDERBILT UNIVERSITY.

DEPARTMENT OF DENTISTRY.



JAMES C. ROSS, D.D.S., Emeritus Professor of Operative Dentistry and Dental Hygiene.
WM. H. MORGAN, M.D., D.D.S., Professor of Clinical Dentistry, Oral Surgery, and Pathology.
ROBERT R. FREEMAN, M.D., D.D.S., Professor of Mechanical and Corrective Dentistry.
THOS. A. ATCHISON, M.D., Professor of Materia Medica and Special Therapeutics.
D. R. STUBBLEFIELD, A.M., M.D., D.D.S., Professor of Chemistry and Metallurgy.
AMBROSE MORRISON, M.D., Professor of Anatomy and Physiology.
ORVILLE H. MENEES, M.D., Professor of Oral Surgery, Histology, and Pathology.
HENRY W. MORGAN, M.D., D.D.S., Professor of Operative Dentistry and Dental Hygiene.

JOHN H. KELLEY, Lecturer on Analytical Chemistry.

DEMONSTRATORS.

A. P. JOHNSTONE, D.D.S., Demonstrator of Operative and Mechanical Dentistry.
SIDNEY S. CROCKETT, M.D., Demonstrator of Anatomy.

The FALL COURSE begins the first Monday in September; the WINTER COURSE the first day of October, and the SPRING COURSE the first Monday in March.

FEES.

Matriculation (paid but once)	$5.00	Professor Tickets for each year	$75.00
Diploma	25.00	Dissecting fee	10.00

The eminent success of the Dental Department of Vanderbilt University has prompted the Board of Trust to erect a large five-story building at a cost of seventy thousand dollars for its accommodation, and for the Law Department. Assurances are had that it will be ready for occupancy during the next term. It will surpass any Dental College building in the United States. ☞

All communications and letters asking further information, and for special catalogues, should be addressed

Dr. W. H. MORGAN, Dean,
12 N. High Street, Nashville, Tenn.

Harvard University, Dental Department.

BOSTON, MASS., 1888-89.

FACULTY.

CHARLES W. ELIOT, LL.D., President.
THOMAS H. CHANDLER, D.M.D., Dean and Professor of Mechanical Dentistry.
DAVID W. CHEEVER, M.D., Professor of Surgery.
HENRY P. BOWDITCH, M.D., Professor of Physiology.
THOMAS DWIGHT, M.D., Professor of Anatomy.
THOMAS FILLEBROWN, M.D., D.M.D., Professor of Operative Dentistry.
WILLIAM B. HILLS, M.D., Professor of Chemistry.
CHARLES A. BRACKETT, D.M.D., Professor of Dental Pathology and Therapeutics.
GEORGE F. GRANT, D.M.D., Instructor in Treatment of Cleft Palate and Cognate Diseases.
CHARLES WILSON, D.M.D., Instructor in Orthodontia.
M. H. RICHARDSON, M.D., Demonstrator of Practical Anatomy.
EDWARD C. BRIGGS, M.D., D.M.D., Instructor in Dental Materia Medica.

OTHER INSTRUCTORS.

HORATIO C. MERIAM, D.M.D., Instructor in Operative Chemistry.
ALLSTON G. BOUVÉ, D.M.D., Instructor in Operative Dentistry.
FOREST G. EDDY, D.M.D., Instructor in Operative Dentistry.
WILLIAM PARKER COOKE, D.M.D., Instructor in Operative Dentistry.
EDWARD E. HOPKINS, D.M.D., Instructor in Operative Dentistry.
Demonstrator of Mechanical Dentistry.
J. E. STANTON, M.D., D.M.D., Instructor in Oral Pathology and Anatomy.
HENRY MICHAEL CLIFFORD, D.M.D., Demonstrator of Operative Dentistry.

The Twentieth Annual Session of this school begins Sept. 27, 1888, and ends June 25, 1889, with a recess of one week at Christmas, and another in April, making a school-year of nine months of practically continuous work.

General Anatomy, by Dr. Thomas Dwight; *Physiology*, by Dr. H. P. Bowditch; and *General Chemistry*, by Dr. Wm. B. Hills, together with ample dissecting under able demonstrators, are the studies of the first year, the dental students taking the whole first-year course of the Harvard Medical School, which is acknowledged to be the most thorough medical course in America. The studies for the second year are Operative and Mechanical Dentistry, Dental Materia Medica and Therapeutics, Oral Surgery, and Surgical Pathology. Attention is called to the fact that *eighteen months* of progressive instruction compose the required two years in the school. Also, that the second year does not repeat the work of the first, but covers entirely different ground. In other schools the work of the second term is usually a repetition of that of the first.

In the Operative and Mechanical Departments measures are taken to keep fully abreast of the times, the great number of patients who apply for operations giving full opportunity to the student for practicing and becoming familiar with every phase of dentistry. All candidates for admission must present a degree in Letters, Science, or Medicine, or pass an examination in English composition, and also in Physics (such as may be had from Balfour Stewart's "Elements of Physics.") For time and place of this examination, see announcement. All applicants for advanced standing must pass the first year's examinations, or furnish proof that they have passed equivalent examinations in some recognized Dental or Medical School.

At the end of each year written and oral examinations test the student's knowledge, and he must pass satisfactorily in a majority of the first-year studies before he can pass on to the second year's class.

To those wishing to take the medical degree the first year of this school is allowed in the Medical School of the University, after passing the required entrance examinations, and also in every other medical school in the land.

The University Degree, D.M.D. (*Dentariæ Medicinæ Doctor*), is conferred upon all who fulfill the requirements.

The diploma is accepted by the English Board of Registration under the new Dental Act, so that graduates of this school, not British subjects, can practice dentistry in Great Britain without further examination.

Graduates of recognized dental schools will be admitted to the courses of Operative and Mechanical Dentistry on payment of $50 each, or $100 for both, for the whole or any portion of the academic year.

FEES.

There are no fees for matriculation, nor for the diploma, nor for the demonstrators. For the first year a student is a member of the school the fee is $200, payable in two installments of $120 and $80; for the second year, $150, in two payments of $100 and $50; for any subsequent year, $50. For information, address

THOMAS H. CHANDLER, Dean,

Hotel Bristol, Cor. Clarendon and Boylston Sts., Boston, Mass.